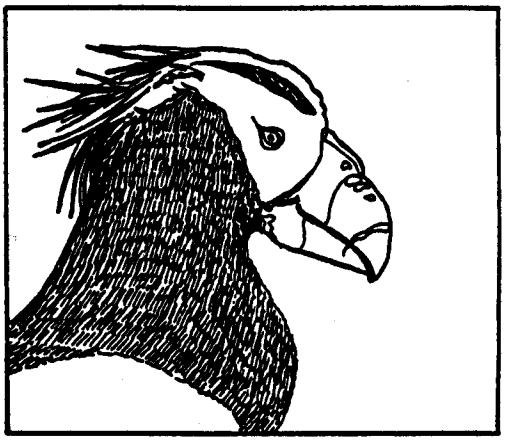
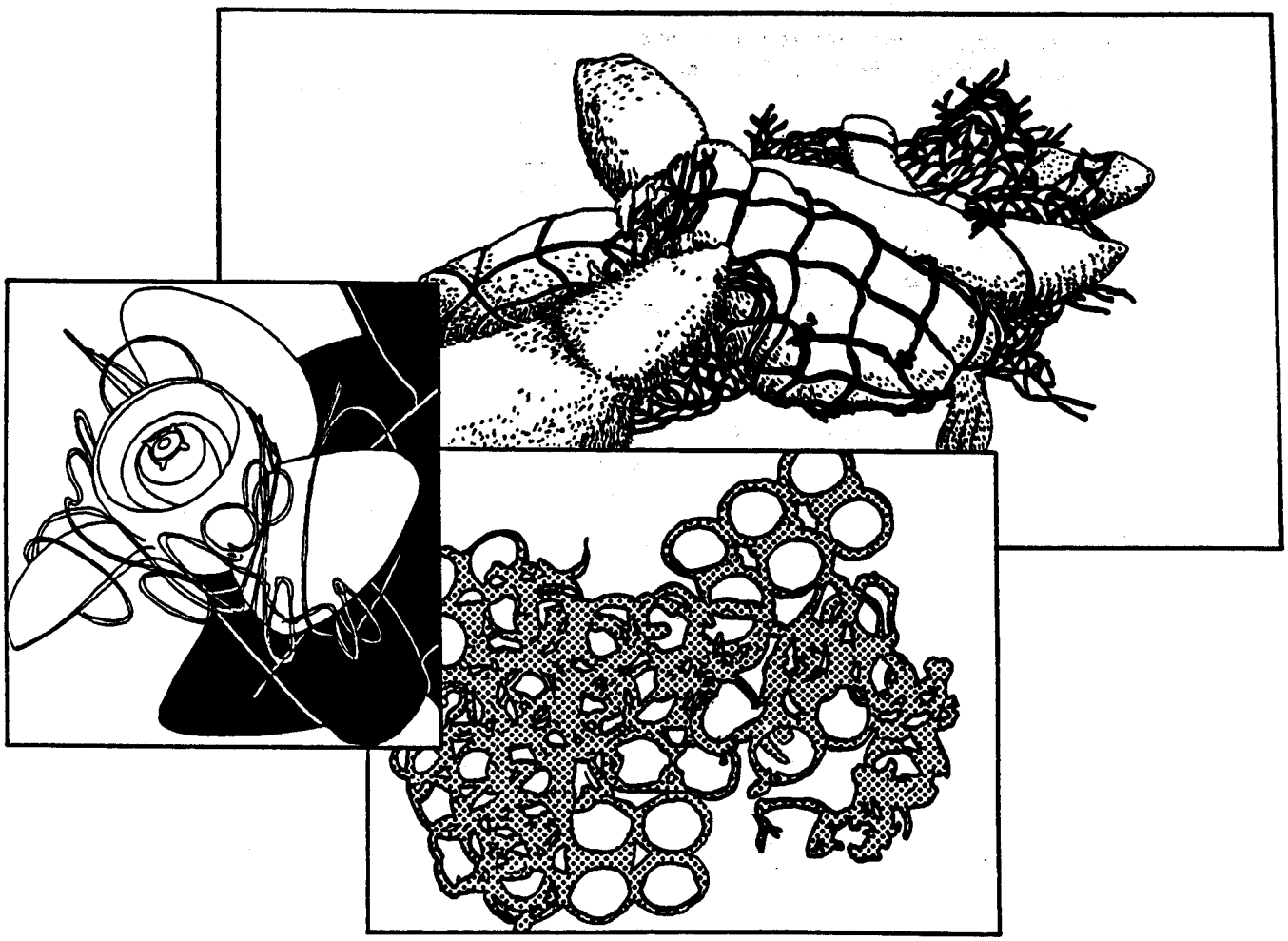
SESSION VI



SOLUTIONS THROUGH LAW AND POLICY



STATUS OF THE U.S. ENVIRONMENTAL PROTECTION AGENCY MARINE DEBRIS ACTIVITIES AND PROGRAMS

David P. Redford
Office of Marine and Estuarine Protection
U.S. Environmental Protection Agency
Washington, D.C. 20460, U.S.A.

ABSTRACT

The U.S. Environmental Protection Agency (EPA) issued on 18 January 1989 an Interim National Coastal and Marine Policy (NCMP), which addresses marine debris as one aspect of a number of marine degradation problems. This policy states that one of EPA's goals is the recovery of full use of shores, beaches, and water by reducing sources of plastics, floatables, and debris.

The EPA's objectives include:

1. To control disposal of medical wastes and aggressively enforce laws to protect the public from exposure to them.

2. To accelerate efforts to identify the sources of floatables, debris, and plastics.

3. To control these materials through new technologies and substitutes, permitting, and enforcement, as well as aggressive source reduction and waste minimization programs.

This paper summarizes the status and progress of many EPA activities and programs aimed at addressing and implementing the marine debris aspects of the NCMP.

DISCUSSION

Plastic debris in the marine environment has been shown to kill or harm marine life, damage vessels, and cause aesthetic and economic damage to beach communities.

The Final Report of the Interagency Task Force on Persistent Marine Debris (1988) described the potential sources of marine debris and separated these sources into two categories: ocean sources and land-based sources. Ocean sources include commercial fishing vessels, recreational

---

In R. S. Shomura and M. L. Godfrey (editors), Proceedings of the Second International Conference on Marine Debris, 2-7 April 1989, Honolulu, Hawaii. U.S. Dep. Commer., NOAA Tech. Memo. NMFS, NOAA-TM-NMFS-SWFSC-154. 1990.

boating, merchant vessels, cruise ships, military and research vessels, and offshore oil rigs and supply vessels. Land-based sources include plastic manufacturing and processing activities, combined sewer overflows (CSO's) and sewage treatment plants, solid waste management practices, and litter. Debris from these sources washes up on U.S. beaches and clogs our waterways. Last summer's problems on the northeastern U.S. beaches show the large-scale impact that marine debris can have.

On 18 January 1989, the U.S. Environmental Protection Agency (EPA) issued an interim National Coastal and Marine Policy (EPA 1989b), which included the agency's position on marine debris.

The EPA is taking action against many of the sources of marine debris described above and the problems they pose. These actions include

- assessment of the items that make up marine debris and their sources,
- assessment of the specific items released to the environment from CSO's and storm sewers,
- medical waste tracking,
- enforcement,
- public education,
- cleanup plans.

Some of EPA's activities are described below in relation to the authority under which they are being implemented.

MARINE PLASTIC POLLUTION RESEARCH AND CONTROL ACT OF 1987

The Marine Plastic Pollution Research and Control Act (P.L. 100-220) (MPPRCA) contains several sections pertaining to plastics and marine debris. Among these are:

1. The development of regulations by the U.S. Coast Guard implementing the requirements of MARPOL Annex V. These regulations set forth the restrictions for disposal of garbage from ships and include prohibition of the disposal of plastics.
2. An assessment of the effects of plastic materials on the marine environment by the Secretary of Commerce.
3. The development of a joint public education program by EPA, the U.S. National Oceanic and Atmospheric Administration (NOAA), and the Secretary of Transportation.

4. An assessment of the problems associated with plastic debris in the New York Bight by the EPA.

5. An assessment by the EPA of methods to reduce plastic pollution.

Activities being carried on by EPA under the requirements of MPPRCA are described below.

New York Bight Report to Congress

The EPA has prepared a report to Congress on plastics in the New York Bight (EPA 1989d), describing the types and sources of floatable debris, the fate of floatable material, the recreational activities, control programs, and recommendations for research, monitoring, and control. The recommendations presented in the report include:

1. Monitoring and surveillance
   - Monitor sources.
   - Monitor beaches and waterways.
2. Local control measures
   - Improve combined sewer overflows.
   - Increase street cleaning.
   - Remove debris from beaches and waterways.
   - Encourage volunteer cleanup activities.
   - Develop public awareness and education campaigns.
3. Research
   - Study the rates of plastic degradation.
   - Study degradable plastics and potential applications.
   - Develop cost-effective recycling approaches.

Public Awareness and Citizen Monitoring

The EPA is working with the NOAA, the Coast Guard, and other agencies in developing citizen monitoring and cleanup patrols and a public awareness program on marine debris. To date, this has included the financial support for this conference, the Second International Conference on Marine Debris held in Hawaii, financial support for the 1988 beach cleanups conducted during Coastweeks by the Center for Environmental Education (now the Center for Marine Conservation (CMC)), and sponsorship of an upcoming informal

roundtable meeting on marine debris. The EPA will be using the results of the Hawaii conference and the roundtable meeting to plan future national-level public education activities.

These future activities will also be developed using the results of the Washington State Marine Debris Task Force studies, where EPA is working with the State of Washington and many Federal, state, and local groups to combat local marine debris problems. This task force, which was set up by Washington State on its own initiative, has pulled together Federal, state, and local interests and published a report (Marine Plastic Debris Task Force 1988). The report makes a variety of recommendations for controlling, monitoring, and removing marine debris. The recommendations already implemented, such as a state information coordinator, derelict fish net removal, and a citizen monitoring program, will be evaluated by EPA as potential activities to be included in the national program to be coordinated with other Federal agencies.

New York Bight Restoration Plan

A New York Harbor Floatables Action Plan (EPA 1989a) was developed as part of the New York Bight Restoration Plan. This floatables action plan describes the routine and responsive monitoring and cleanup activities that will occur in New York Harbor to remove floating debris that may cause environmental, aesthetic, and economic damage. The plan includes:

1. routine monitoring and cleanup of debris (particularly during times of extreme high tides or major storm events) using vessels, helicopters, and planes to monitor and specially designed vessels to cleanup debris;

2. development of a reporting and action network to report sightings of debris;

3. a contingency plan using the reporting network to activate the cleanup vessels to respond to reports of debris sightings.

Methods to Reduce Plastic Pollution

The EPA is preparing a report, due to Congress in the summer of 1989, which describes:

- the production of and major markets for plastics in the United States;

- the generation of plastic waste in the United States;

- the impacts of plastics on the management of solid wastes in the United States including transportation, disposal in landfills, and incineration;

- the sources, fates, and effects of plastics in the marine environment;
- an evaluation of potential solutions such as source reduction, use of degradable plastics, recycling, and substitution; and
- recommendations for action.

In assessing the potential sources and fates of plastics for this report to Congress, EPA has funded several field investigations. One such study was the 1988 CMC beach cleanups previously mentioned. These data will help determine the distribution of plastic articles on our nation's beaches and will be useful in determining which items are most prevalent and where EPA must focus more effort. The 1988 data and data from previous beach cleanups will be a useful baseline in estimating the effect of the U.S. regulations to implement MARPOL Annex V and other mitigation efforts. Future beach surveys will be used in an attempt to indicate trends and possibly show the effectiveness of the new controls on shipboard sources of plastic debris. It may still be difficult, however, to determine which plastic articles found on beaches come from shore-based sources and which come from vessels.

To determine the variability of plastic items in inshore waters and to assess the harbors as potential sources of debris in other coastal areas, the EPA has also conducted field investigations of the floating debris in several U.S. harbors through a contract to Battelle Ocean Sciences of Duxbury, Massachusetts (December 1988-February 1989). Harbors surveyed include Boston, New York, Philadelphia, Baltimore, Miami, Seattle, Tacoma, San Francisco, and Oakland. These surveys were conducted by towing surface nets through slicks of floating debris and then sorting, identifying, and counting the contents. Plastic items 0.3 mm and larger were studied, yielding information on not only the larger plastic items readily observed on beaches but also on the smaller plastic pellets and pieces which are not so obvious to a casual observer. The final EPA report of these surveys is currently being prepared. A summary of preliminary results is presented by Trulli et al. (1990). The preliminary findings of these surveys indicates that the presence of certain plastic items can be directly linked to the presence of CSO's where storm water and street runoff combine with sewage at times of heavy rain and are discharged directly into receiving water.

The apparent correlation between certain debris items and the presence of CSO's is the basis for a new study, being designed by Battelle Ocean Sciences, where the materials released from several of the CSO's in two cities, Philadelphia and Boston, will be identified and quantified. To do this, EPA will be placing nets around the outfalls from selected CSO's in these cities (May-June 1989) to collect the materials exiting the system during dry weather and during rainy conditions. The results of this study will directly address CSO's as a source of debris, and will be used by the agency in determining the appropriate actions to be taken under the Clean Water Act. Storm drains will also be sampled during this study to determine their contribution to marine debris.

LITTER FROM VESSEL TRANSPORT OF SOLID WASTE

The Shore Protection Act (P.L. 100-688, Sections 4001-4204) provides for controls on operations relating to the vessel transport of certain solid wastes (i.e., municipal or commercial waste) so that these wastes are not deposited in coastal waters.

The EPA is developing guidance with the Coast Guard to minimize deposition of solid wastes into coastal waters during loading, transporting, or unloading. A permit and enforcement program is being developed by the U.S. Department of Transportation such that all vessels transporting solid wastes would require a permit from the Coast Guard. It is estimated that about 400 vessels will need permits--about 100 in the New York Harbor area and 300 in the Gulf of Mexico, plus a few in other locations.

Under this act, EPA is also preparing a report to Congress describing the need and effectiveness of a tracking system for vessels transporting wastes in U.S. waters. Such a tracking system could be used to monitor the movement of wastes in U.S. waters and provide the agency with a mechanism for assuring that wastes are not illegally discharged.

In New York Harbor, an area where large volumes of trash are transported by barges, the State and City of New York have strengthened the requirements for trash barges. The implementation of these requirements is expected to minimize the loss of trash during the marine transport process. The new requirements include:

- limitations on load heights in barges;
- the placement of booms around marine transfer facilities;
- the use of scavenger vessels at marine transfer facilities to collect trash which falls into the water;
- the use of covers over barges to keep the wind from blowing trash off barges.

MEDICAL WASTE--TRACKING AND DISPOSAL

The Medical Waste Tracking Act of 1988 (P.L. 100-582) requires EPA to develop a 2-year demonstration program for the tracking of medical wastes. This program would track the generation and movement of medical wastes from "cradle to grave."

The EPA has prepared an Interim Final Regulation (EPA 1989e) which describes a tracking system to be used by the states participating in the demonstration program. Medical wastes from generators of 22.7 kg (50 lb) or greater per month would have to track the movement of their wastes to the point of final disposition. Generators of less than 22.7 kg (<50 lb) per month have the same requirements but need to keep logs for their medical wastes rather than initiate tracking forms. It is anticipated that

this tracking system will allow EPA to monitor the movement of medical wastes from the point of generation to final disposal and will assure that the wastes are not disposed of illegally where they may endanger public health or degrade the marine environment.

The U.S. Public Vessel Medical Waste Anti-Dumping Act of 1988 (P.L. 100-688 Sections 3101-3105) requires that all public vessels have a management plan for medical wastes on board ship and prohibits the disposal of these wastes at sea except in times of national emergency. The EPA is distributing guidance to all EPA programs that operate boats and ships. The guidance states EPA's policy that all medical wastes generated on board an EPA vessel will be stored in a secure area on board for disposal at an appropriate shore-based facility upon return from sea. No medical wastes can be thrown overboard. Other Federal agencies are also required by the act to issue similar guidance.

COMBINED SEWER OVERFLOWS AND STORM SEWERS

The Clean Water Act (33 U.S.C. 1251 et seq.) requires EPA to regulate discharges from municipal and industrial outfalls into U.S. waters. Under this authority, the agency recently developed a strategy for enforcing the provisions of the act regarding CSO's (EPA 1989c), which are significant sources of plastic street debris entering the marine environment.

The strategy requires that all CSO's be identified and categorized according to their status of compliance with technology and water quality-based regulations. There are about 1,200 combined sewer systems in the United States serving an estimated population of 43 million. States will be required to develop a state-wide strategy for the development and implementation of measures to reduce pollutant discharges from CSO's.

The EPA strategy sets forth three objectives:

1. to ensure that all CSO discharges occur only as a result of wet weather;

2. to bring all wet weather CSO discharge points into compliance with the technology-based requirements of the Clean Water Act and applicable state water quality standards; and

3. to minimize water quality, aquatic biota, and human health impacts from wet weather overflows that do occur.

The strategy confirms that CSO's are point sources independent of the treatment works and reaffirms that both technology-based and water quality-based requirements apply to CSO's. The strategy emphasizes that CSO point sources which are discharging without a permit are unlawful and must be issued permits or eliminated.

The agency has also proposed regulations which will describe the effluent requirements for storm sewers (EPA 1988). By controlling

the effluent from CSO's and storm drains, the agency hopes to significantly curtail the discharge of sewage and sewage-related plastics and street litter into the marine environment at times of heavy rain. To implement the types of controls available for long-term solutions will require major resource expenditures.

ENFORCEMENT ACTIONS

The Ocean Dumping Regulations (40 CFR parts 220-229), which implement a section of the Marine Protection, Research, and Sanctuaries Act (MPRSA) (33 U.S.C. 1401 et seq.), were promulgated in 1977. These regulations prohibit the transport for the purpose of dumping into the ocean of any "persistent inert synthetic or natural materials which may float or remain in suspension in the ocean in such a manner that they may interfere materially with fishing, navigation, or other legitimate uses of the ocean." Activities involving transport for the purpose of disposal at sea are regulated under this act, and permits granted by the agency prohibit the dumping of floatable plastics. Any activity involving the transport of floatable plastics or debris out to sea for the purpose of dumping is illegal, and subject to the fines and penalties described under the act.

Under this authority, EPA has initiated enforcement actions against Nassau County and the City of Long Beach, in New York, and National Seatrade, Inc., for the disposal of sludge containing plastics at the 170.5-km (106-mi) sewage sludge disposal site.

The agency is seeking a total of $100,000 in fines for these violations of the MPRSA. The county, city, and National Seatrade, which barges treated sewage sludge, are charged with one violation which occurred in September 1988 when EPA staff observed floatables being dumped along with sewage sludge from the county and city at the 170.5-km (106-mi) site. The proposed civil penalty for this violation is $50,000. The city is also charged in a second count with sending floatables along with its sludge to be ocean dumped in December 1988. The proposed penalty for this violation is $50,000.

CONCLUSION

The EPA is taking steps to identify and control sources of marine debris, to cleanup existing marine debris, and to involve and educate the public through cooperation with other Federal, state, and local groups. Through a combined effort, EPA hopes to greatly reduce the volume of marine debris generated and its impacts. The EPA believes that one of the primary steps in reaching this goal is to control nondegradable debris before it becomes marine debris--that is, to control it at its source. This should include source reduction and recycling as well as general pollution prevention. Wastes must be managed correctly not only by transport and disposal companies but also by the consumer. Litter thrown into the streets or directly into waterways does have an impact on the marine environment. Plastic items flushed down toilets can, in some cities, end up in the ocean through combined sewer overflows or treatment plant shutdowns. The actions being taken today by EPA as well as other Federal, state, and local

agencies will have a beneficial impact on the environment. These actions must be supplemented, however, by consumers. Proper handling of discarded items by consumers is essential for the trash and sewage collection systems to work. It is the responsibility of all Federal, state, and local agencies to get this message out and build a national/world environmental ethic, or we will be forever cleaning up our environment rather than enjoying and benefiting from it.

REFERENCES

Interagency Task Force on Persistent Marine Debris.
1988. Final report. Interagency Task Force on Persistent Marine Debris, 170 p.

Marine Plastic Debris Task Force.
1988. Marine plastic debris action plan for Washington State. Marine Plastic Debris Task Force, Washington State Department of Natural Resources, 2d ed., December 1988, var pag.

Trulli, W. R., H. K. Trulli, and D. P. Redford.
1990. Characterization of marine debris in selected harbors of the United States. *In* R. S. Shomura and M. L. Godfrey (editors), Proceedings of the Second International Conference on Marine Debris, 2-7 April 1989, Honolulu, Hawaii. U.S. Dep. Commer., NOAA Tech. Memo. NMFS, NOAA-TM-NMFS-SWFSC-154. [See this document.]

U.S. Environmental Protection Agency.
1988. National pollution discharge elimination system permit application regulations for storm water discharges; proposed regulations. 53 FR 49416 (Dec. 7, 1988).

1989a. Action plan for addressing floatable debris in the New York Bight. Prepared by Battelle Ocean Sciences for Environmental Protection Agency Region II, 15 p.

1989b. Interim coastal and marine policy. U.S. Environmental Protection Agency, Wash., D.C.

1989c. Interim final national combined sewer overflow control strategy. U.S. Environmental Protection Agency, Wash. D.C.

1989d. Report to Congress on the New York Bight Plastics Study, Section 2302, Subtitle C of Marine Plastic Pollution, Research and Control Act of 1987, Title II of the United States-Japan Fishery Agreement Approval Act of 1987, P.L. 100-220, 25 p.

1989e. Standards for the tracking and management of medical waste; interim final rule and request for comments. 40 CFR parts 22 and 259.

INTERNATIONAL REGULATIONS FOR THE PREVENTION AND CONTROL OF POLLUTION BY DEBRIS FROM SHIPS

David T. Edwards and Edward Rymarz
International Maritime Organization
London SE1 7SR, United Kingdom

(The views expressed herein are those of the authors and are not necessarily those of the International Maritime Organization.)

ABSTRACT

The amount of solid wastes entering the world's oceans each year is estimated to be in millions of metric tons. The sea floor, water surface, and beaches of the Earth's marine environment are littered with man-made materials. Studies show that most of the refuse washed up on beaches comes from ships. The International Maritime Organization, being responsible for the prevention and control of marine pollution from ships, adopted in 1973 the International Convention for the Prevention of Pollution from Ships. This convention, as modified by the 1978 Protocol hereafter referred to as MARPOL 73/78, applies to any ship of any type whatsoever. It covers all aspects of intentional pollution from ships by oil (Annex I), noxious substances carried in bulk (Annex II), or in packaged forms (Annex III), sewage (Annex IV), and garbage (Annex V).

The Annex V of MARPOL 73/78, entitled "Regulations for the Prevention of Pollution by Garbage from Ships," entered into force on 31 December 1988. In order to assist governments in developing and enacting domestic laws which would implement Annex V, the Marine Environment Protection Committee of the International Maritime Organization developed the Guidelines for the Implementation of Annex V of MARPOL 73/78. The guidelines are discussed in this paper.

INTRODUCTION

A considerable amount of debris originating from ships is disposed of at sea. Garbage from ships has traditionally been dumped into the sea as a matter of course and in proportion to the amount of similar wastes poured into the sea each year from the land. The quantities of waste disposed of in this way in the past are not considered excessive.

In R. S. Shomura and M. L. Godfrey (editors), Proceedings of the Second International Conference on Marine Debris, 2-7 April 1989, Honolulu, Hawaii. U.S. Dep. Commer., NOAA Tech. Memo. NMFS, NOAA-TM-NMFS-SWFSC-154. 1990.

Today, however, the situation is very different. One reason is the growing everyday use of substances such as plastics which are nonbiodegradable: Once thrown into the sea, they are extremely persistent and potentially harmful if ingested by seabirds and marine mammals. Also, the aesthetic quality of coastlines and beaches has been devalued by the accumulation of such wastes.

Studies carried out in the United Kingdom by The Tidy Britain Group in 1978-79 showed that most of the refuse washed up on British beaches came from ships. Of some 20,000 items recovered, 42% were plastic (mostly containers of household products such as disinfectants, bleach, and washing-up liquid) and 22% metal. Of the latter, more than two-thirds turned out to be drink cans (International Maritime Organization (IMO) 1988b).

The amount of wastes generated by ships can be prodigious. A study carried out by a marine biologist at Newcastle University in 1982 showed that during a 44-day voyage, the 46 members of a merchant ship's crew dumped overboard 320 cardboard or paper boxes, 370 plastic beer-can holders, 162 crisp packets, 19 plastic bags, 2 plastic drums, 240 bottles, 5 glasses, 5,176 cans, and 2 metal drums. Not surprisingly perhaps, the same survey showed that of 600 ships entering ports in South Wales in 1977-78, only 13.5% used the waste disposal facilities provided on shore (Jones et al. 1981).

More recently, a survey carried out in the German Bight showed that the minimum amount of refuse drifting between Helgoland and the Elbe estuary is approximately 8.5 million pieces annually with a weight of 1,300 metric tons (MT), and 95% of the refuse found could be attributed to shipping (Vauk et al. 1987). In the Mediterranean, litter generated by shipping and oil drilling has been estimated at 325×10^6 kg/year. The total amount of litter generated in the world's oceans each year, assuming all ships' solid wastes are disposed of overboard, has been estimated at 6.5×10^6 MT/annum (Dixon and Dixon 1983).

According to the Center for Environmental Education (1986), the worldwide rate of disposal of domestic litter from merchant ships has been estimated at 110,000 MT, 0.7% of which is plastic. The amount of cargo-associated wastes including dunnage, shoring, pallets, wires, and covers is estimated at 5.6 million MT per year. Our considerations are limited to prevention of marine pollution from ships.

REGULATIONS DEVELOPED BY THE INTERNATIONAL MARITIME ORGANIZATION

To mitigate and control or even eliminate operational discharge from ships into the sea of all kinds of wastes including disposal of garbage, the IMO adopted in 1973 the International Convention for the Prevention of Pollution from Ships. This convention as modified by the 1978 Protocol (MARPOL 73/78) applies to any ship of any type whatsoever including hydrofoil boats, air-cushion vehicles, submersibles, floating rafts, and fixed or floating platforms operating in the marine environment. It covers all

aspects of intentional pollution from ships by oil (Annex I), noxious substances carried in bulk (Annex II) or in packaged forms (Annex III), sewage (Annex IV), and garbage (Annex V). (Annex V is attached as Appendix A.)

As of 8 February 1989, 55 states--the combined merchant fleets of which constitute 80.92% of gross tonnage of the world's merchant shipping--ratified the convention.

The Annexes III, IV, and V of MARPOL 73/78 are so-called "optional annexes." Each of them enters into force 12 months after the date on which at least 15 states with a combined merchant fleet of at least 50% of the gross tonnage of the world's merchant shipping have accepted it. With respect to Annex V, these conditions were fulfilled in December 1987, and subsequently, in accordance with the provisions of article 15(2) of the MARPOL Convention, this annex entered into force on 31 December 1988.

Thirty-nine states--the combined merchant fleets of which constitute 56.6% of gross tonnage of the world's merchant shipping--ratified Annex V. As of 8 February 1989, the states that have accepted Annex V are: Algeria, Antigua and Barbuda, Austria, Belgium, China, Colombia, Cote d'Ivoire, Czechoslovakia, Democratic People's Republic of Korea, Denmark, Egypt, Finland, France, Gabon, German Democratic Republic, Federal Republic of Germany, Greece, Hungary, Italy, Japan, Lebanon, Marshall Islands, Netherlands, Norway, Oman, Panama, Peru, Poland, Portugal, St. Vincent and Grenadines, Suriname, Sweden, Tunisia, Tuvalu, United Kingdom, U.S.S.R., United States, Uruguay, and Yugoslavia.

ANNEX V

The purpose of Annex V, in particular, is to prevent pollution caused by dumping into the sea all kinds of solid waste garbage, which includes inter alia all plastics, synthetic ropes, synthetic fishing nets, and plastic garbage bags. Disposal into the sea of all plastics is completely prohibited in all areas. However, some other forms of garbage may be disposed of at sea under strictly controlled conditions.

Dunnage, lining, and packing materials can only be disposed of at sea more than 25 nmi from land. Food wastes and all other garbage (including paper products, rags, glass, metal, bottles, and crockery) cannot be disposed of at sea within 12 nmi of land. Even stricter controls apply in sea areas called "special areas." For the purpose of Annex V, the special areas are: The Mediterranean Sea Area, the Baltic Sea Area, the Black Sea Area, the Red Sea Area, and the Gulfs Area. The Gulfs Area means the sea area located northwest of the rhumb line between Ras al Hadd (lat. 22°30'N, long. 59°48'E) and Ras al Fasteh (lat. 25°04'N, long. 61°25'E).

In order for ships to fully comply with the requirements on disposal of garbage within the special areas, they should be provided at ports and terminals in that area with facilities for the reception of garbage, without causing undue delay to ships.

Therefore, the government of each party to the convention whose coastline borders a special area is obliged to ensure that as soon as possible in all ports within the area, adequate reception facilities will be provided in accordance with Annex V regulations, taking into account the special needs of ships operating therein.

The IMO, after receiving notification from all governments of the states bordering a special area where adequate reception facilities have been provided, establishes the date when the requirements of the regulations on special areas shall take effect.

So far, only the states of the Baltic Sea Area (Denmark, Finland, German Democratic Republic, Federal Republic of Germany, Poland, Sweden, and U.S.S.R.) have notified IMO that requirements concerning provision of adequate reception facilities in that area have been fulfilled. The IMO notified all parties to the convention that 1 October 1989 was the established date, and starting on that date, the requirements on disposal of garbage within the Baltic Sea Area took effect (Resolution Marine Environment Protection Committee (MEPC) 31(26) adopted on 9 September 1988).

The establishment of special requirements for disposal of garbage from fixed and floating platforms is incorporated in Annex V. The disposal of any materials regulated by Annex V is completely prohibited from fixed and floating platforms which are engaged in exploration, exploitation, and associated offshore processing of seabed mineral resources, and from all other ships when alongside or within 500 m of such platforms.

The exception is the disposal into the sea of food wastes, which are permitted when they have been passed through a comminuter or grinder, but only when such fixed or floating platforms are located more than 12 nmi from land and all other ships are alongside or within 500 m of such platforms.

Limitations on the discharge of garbage from ships, as specified in Annex V, are summarized in Table 1.

GUIDELINES FOR THE IMPLEMENTATION OF ANNEX V OF MARPOL 73/78

The MEPC of the IMO at consecutive sessions in 1987 and 1988 considered the problem of implementation of Annex V. The working groups on optional annexes, under the chairmanship of T. A. Wastler for the 24th and 25th sessions and D. B. Pascoe for the 26th session, both chairmen from the United States, worked on the development of the Guidelines for the Implementation of Annex V of MARPOL 73/78, which were approved at the 26th session of MEPC, 5-9 September 1988 (IMO 1988a).

The main objectives of these guidelines are to (1) assist governments which have ratified Annex V in developing and enacting domestic laws which give force to and implement Annex V; (2) assist vessel operators in complying with the requirements set forth in Annex V and domestic laws;

Table 1.--Summary of at-sea garbage disposal regulations, MARPOL, Annex V.

Garbage type	All ships except platforms[a]		Offshore platforms[a]
	Outside special areas	In special areas[b]	
Plastics--includes synthetic ropes and fishing nets and plastic garbage bags	Disposal prohibited	Disposal prohibited	Disposal prohibited.
Floating dunnage, lining, and packing materials	>25 nmi from nearest land	Disposal prohibited	Disposal prohibited.
Paper, rags, glass, metal, bottles, crockery, and similar refuse	>12 nmi from nearest land	Disposal prohibited	Disposal prohibited.
All other garbage including paper rags, glass, etc., comminuted or ground	>3 nmi from nearest land	Disposal prohibited	Disposal prohibited.
Food waste not comminuted or ground	>12 nmi from nearest land	>12 nmi from nearest land	Disposal prohibited.
Food waste comminuted or ground[c]	>3 nmi from nearest land	>12 nmi from nearest land	>12 nmi from nearest land.
Mixed refuse types	(d)	(d)	(d)

[a]Offshore platforms and associated ships include all fixed or floating platforms engaged in exploration or exploitation of seabed mineral resources, and all ships alongside or within 500 m of such platforms.

[b]Garbage disposal regulations for special areas shall take effect in accordance with regulation 5(4)(b) of Annex V.

[c]Comminuted or ground garbage must be able to pass through a screen with mesh size no larger than 25 mm.

[d]When garbage is mixed with other harmful substances having different disposal or discharge requirements, the most stringent disposal requirements shall apply.

Note: The Baltic Sea Special Area Disposal Regulations take effect on 1 October 1989.

and (3) assist port and terminal operators in assessing the need for and providing adequate reception facilities for garbage generated on different types of ships.

The guidelines are divided into seven categories that provide a general framework upon which governments will be able to formulate programs for education and training of seafarers and others who must comply with the regulations; methods of reducing shipboard generation of garbage; shipboard garbage handling and storage procedures; shipboard equipment for processing garbage; estimation of the amounts of ship-generated garbage delivered to port; and actions to ensure compliance with the regulations.

Recognizing that Annex V regulations promote waste management systems for ships, and that ships vary tremendously in size, mission, complement, and capability, these guidelines include a range of waste management options that may be combined in many ways to facilitate compliance with Annex V. Further, recognizing that waste management technology for ships is in an early stage of development, it is recommended that governments and the IMO continue to gather information and review these guidelines periodically.

The convention provides definitions for terms used throughout these guidelines which establish the scope of Annex V requirements. These definitions are incorporated in Section 1 as follows:

- "Food waste" is any spoiled or unspoiled victual substance such as fruits, vegetables, dairy products, poultry, meat products, food scraps, food particles, and all other material contaminated by such waste generated aboard ship, principally in the galley and dining areas.

- "Plastic" is any solid material which contains as an essential ingredient one or more synthetic organic high polymers and which is formed (shaped) by heat and/or pressure during either manufacture of the polymer or its fabrication into a finished product. Plastics have material properties ranging from hard and brittle to soft and elastic. Plastics are used for a variety of marine purposes including, but not limited to, packaging (vapor-proof barriers, bottles, containers, liners), ship construction (fiberglass and laminated structures, siding, piping, insulation, flooring, carpets, fabrics, paints and finishes, adhesives, electrical and electronic components), disposable eating utensils and cups, bags, sheeting, floats, fishing nets, strapping bands, and rope and line.

- "Domestic waste" includes all types of food wastes and wastes generated in the living spaces on board ship.

- "Cargo-associated waste" is all materials which have become wastes as a result of use for cargo stowage and handling on board ship. Cargo-associated waste includes but is not

limited to dunnage, shoring, pallets, lining and packing materials, plywood, paper, cardboard, wire, and steel strapping.

- "Maintenance waste" is materials collected by the engine and deck departments while maintaining and operating the vessel, such as soot, machinery deposits, scraped paint, deck sweeping, wiping wastes, and rags.

- "Operational waste" is all cargo-associated waste and maintenance waste, and cargo residues defined as garbage in "Cargo residues" (see below).

- "Dishwater" is the residue from the manual or automatic washing of dishes and cooking utensils which have been precleaned to the extent that any food particles adhering to them would not normally interfere with the operation of automatic dishwashers. "Gray water" is drainage from dishwater, shower, laundry, bath, and washbasin drains and does not include drainage from toilets, urinals, hospitals, and animal spaces or drainage from cargo spaces.

- "Oily rags" are rags which have been saturated with oil as controlled in Annex I to the convention. "Contaminated rags" are rags which have been saturated with a substance defined as a harmful substance in the other annexes to the convention.

- "Cargo residues," for the purposes of these guidelines, are defined as remnants of any cargo material on board that cannot be placed in proper cargo holds (loading excess and spillage) or which remain in cargo holds and elsewhere after unloading procedures are completed (unloading residual and spillage). Cargo residues are expected to be in small quantities.

- "Fishing gear" is defined as any physical device or part thereof or combination of items that may be placed on or in the water with the intended purpose of capturing, or controlling for subsequent capture, living marine or freshwater organisms.

- "Seafarer," for the purposes of these guidelines, means anyone who goes to sea in a ship for any purpose including, but not limited to, transport of goods and services, exploration, exploitation and associated offshore processing of seabed mineral resources, fishing, and recreation.

In order to clarify the application of Annex V, the following comments and explanations were added.

- Dishwater and gray water are not included as garbage in the context of Annex V.

- Ash and clinkers from shipboard incinerators and coal burning boilers are operational wastes in the meaning of Annex V regulation 1(1) and therefore are included in the term "all other garbage" in the meaning of Annex V Regulations 3(1)(b)(ii) and 5(2)(a)(ii).

- Cargo residues are to be treated as "garbage" under Annex V except when those residues are substances defined or listed under the other annexes to the convention.

- Cargo residues of all other substances are not explicitly excluded from disposal as "garbage" under the overall definition of garbage in Annex V. However, certain of these substances may pose harm to the marine environment and because of their possible safety hazards may not be suitable for disposal at reception facilities equipped to handle general garbage. The disposal of such cargo residues should be based on the physical, chemical, and biological properties of the substance and may require special handling not normally provided by garbage reception facilities.

The remaining sections of the guidelines follow.

Training, Education, and Information

The definition of "ships" used in the convention requires these guidelines address not only the professional and commercial maritime community but also the noncommercial seafaring population as sources of pollution of the sea by garbage. Uniform programs in the field of training and education will make a valuable contribution to raising the level of the seafarers' compliance with Annex V, thereby ensuring compliance with the convention. Accordingly, governments should develop and undertake training, education, and public information programs suited for all seafaring communities under their jurisdictions.

Governments may exchange and maintain information relevant to compliance with Annex V regulations through the IMO. Accordingly, governments are encouraged to provide the organization with the following:

- Technical information on shipboard waste management methods such as recycling, incineration, compaction, sorting and sanitation systems, packaging, and provisioning methods.

- Copies of current domestic laws and regulations relating to the prevention of pollution of the sea by garbage.

- Educational materials developed to raise the level of compliance with Annex V. Contributions of this type include printed materials, posters, brochures, photographs, audio-

and videotapes, and films as well as synopses of training programs, seminars, and formal curriculums.

- Information and reports on the nature and extent of marine debris found along beaches and in coastal waters under their respective jurisdictions. In order to assess the effectiveness of Annex V, these studies should provide details on amounts, distribution, sources, and impacts of marine debris.

Governments are encouraged to amend their maritime certification examinations and requirements, as appropriate, to include a knowledge of duties imposed by national and international law regarding the control of pollution of the sea by garbage.

Governments are recommended to require all ships of their registry to permanently post a summary declaration stating the prohibition and restrictions for discharging garbage from ships under Annex V and the penalties for failure to comply. It is suggested this declaration be placed on a placard at least 12.5 × 20 cm made of durable material and fixed in a conspicuous place in galley spaces, mess deck, wardroom, bridge, main deck, and other areas of the ship, as appropriate. The placard should be printed in the language or languages understood by the crew and passengers.

Governments are encouraged to have maritime colleges and technical institutes under their jurisdiction develop or augment curriculums to include both the legal duties and the technical options for handling ship-generated garbage available to professional seafarers. These curriculums should also include information on environmental impacts of garbage. Suggested topics are listed below:

- Garbage in the marine environment, sources, types, and impacts.
- National and international laws related to or impinging upon shipboard waste management.
- Health and sanitation considerations related to the storage, handling, and transfer of ship-generated garbage.
- Current technology for onboard and shoreside processing of ship-generated garbage.
- Provisioning options, materials, and procedures to minimize the generation of garbage aboard ship.

Professional associations and societies of ship officers, engineers, naval architects, shipowners and managers, and seamen are encouraged to ensure their members' competency regarding the handling of ship-generated garbage.

Vessel and reception facility operators should establish training programs for personnel operating and maintaining garbage reception or processing equipment. It is suggested that the programs include instruction on what constitutes garbage and the applicable regulations for handling and disposing of it. Such training should be reviewed annually.

Generalized public information programs are needed to provide information to nonprofessional seafarers and others concerned with the health and stability of the marine environment regarding the impacts of garbage at sea. Governments and involved commercial organizations are encouraged to utilize the organization's library and to exchange resources and materials as appropriate to initiate internal and external public awareness programs.

Methods for delivering this information include radio and television, articles in periodicals and trade journals, voluntary public projects such as beach cleanup days and adopt-a-beach programs, public statements by high government officials, posters, brochures, conferences and symposia, cooperative research and development, voluntary product labeling, and teaching materials for public schools.

Audiences include recreational boaters and fishermen, port and terminal operators, coastal communities, ship supply industries, shipbuilders, waste management industries, plastic manufacturers and fabricators, trade associations, educators, and government.

The subjects addressed in these programs are recommended to include the responsibilities of citizens under national and international law; options for handling garbage at sea and upon return to shore; known sources and types of garbage; impacts of plastic debris on seabirds, fish, marine mammals, sea turtles, and ship operations; impacts on coastal tourist trade; current actions by governments and private organizations; and sources of additional information.

Minimizing the Amount of Potential Garbage

All ship operators should minimize the taking aboard of potential garbage and onboard generation of garbage.

Domestic wastes may be minimized through proper provisioning practices. Ship operators and governments should encourage ship's suppliers and provisioners to consider their products in terms of the garbage they generate. Options available to decrease the amount of domestic waste generated aboard ship include the following:

- Bulk packaging of consumable items. This may result in the creation of less waste, but factors such as inadequate shelf life once a container is opened must be considered to avoid increasing wastes.

- Reusable packaging and containers. This can decrease the amount of garbage being generated. Use of disposable cups,

utensils, dishes, towels and rags, and other convenience items should be limited.

- Provisions packaged in or made of materials other than disposable plastic. These should be selected to replenish ship supplies unless a reusable plastic alternate is available.

Operational waste generation is specific to individual ship activities and cargoes. It is recommended that manufacturers, shippers, ship operators, and governments consider the garbage associated with various categories of cargoes and take actions as needed to minimize their generation. Suggested actions are listed below.

- Replace disposable plastic sheeting used for cargo protection with permanent, reusable covering materials.

- Adopt stowage systems and methods that reuse coverings, dunnage, shoring, lining, and packing materials.

- Dispose of dunnage, lining, and packaging materials generated in port during cargo discharge at the port reception facilities and do not retain it on board for discharge at sea.

It may, in certain cases, be difficult for port reception facilities to handle cargo residues. They are usually created through inefficiencies in loading, unloading, and onboard handling, and it is, therefore, recommended that cargo be unloaded as efficiently as possible in order to avoid or minimize cargo residues.

Spillage of the cargo during transfer operations should be carefully controlled, both on board and from dockside. Spillage typically occurs in port. It should be completely cleaned up prior to sailing and either delivered into the intended cargo space or into the port reception facility. Shipboard areas where spillage is most common should be protected so that the residues are easily recovered.

Fishing gear once discharged becomes a harmful substance. Fishing vessel operators, their organizations, and their respective governments are encouraged to undertake such research, technology development, and regulations as may be necessary to minimize the probability of loss and maximize the probability of recovery of fishing gear from the ocean. It is recommended that fishing vessel operators record and report the loss and recovery of fishing gear. Techniques both to minimize the amount of fishing gear lost in the ocean and to maximize its recovery are listed below.

- Operators and associations of fishing vessels using untended, fixed, or drifting gear are encouraged to develop information exchanges with such other ship traffic as may be necessary to minimize accidental encounters between ships and gear.

Governments are encouraged to assist in the development of information systems where necessary.

- Fishery managers are encouraged to consider the probability of encounters between ship traffic and fishing gear when establishing seasons, areas, and gear-type regulations.

- Fishery managers and fishing vessel operators and associations are encouraged to utilize gear identification systems which provide information such as vessel name, registration number, and nationality. Such systems may be useful to promote reporting, recovery, and return of lost gear.

- Fishing vessel operators are encouraged to document positions and reasons for loss of their gear. To reduce the potential of entanglement and ghost fishing (capture of marine life by discharged fishing gear), benthic traps, trawls, and gillnets could be designed to have degradable panels or sections made of natural fiber twine, wood, or wire.

- Governments are encouraged to consider the development of technology for more effective fishing gear identification systems.

Governments are encouraged to undertake research and technology development to minimize potential garbage and its impacts on the marine environment. Following are suggested areas for such study:

- Development of recycling technology and systems for synthetic materials returned to shore as garbage.

- Development of technology for degradable synthetic materials to replace current plastic products, as appropriate. In this connection, governments should also study the impacts on the environment of the products of degradation of such new materials.

Shipboard Garbage Handling and Storage Procedures

Compliance with limitations on the discharge of garbage from ships as specified in Annex V requires personnel, equipment, and procedures for collecting, sorting, processing, storing, and disposing of garbage. Economic and procedural considerations associated with these activities include storage space requirements, sanitation, equipment and personnel costs, and in-port garbage service charges.

In complying with the provisions of Annex V, the most appropriate procedures for handling and storing garbage on ships will vary depending on factors such as the type and size of the ship, the area of operation (e.g., distance from nearest land), shipboard garbage processing equipment and storage space, crew size, duration of voyage, and regulations and reception

facilities at ports of call. Proper handling and storage minimize shipboard storage space requirements and enable efficient transfer of retained garbage to port reception facilities.

To ensure that the most effective and efficient handling and storage procedures are followed, it is recommended that vessel operators develop waste management plans that can be incorporated into crew and vessel operating manuals. Such plans should include the appointment of an environmental control officer. The manuals should identify crew responsibilities and procedures for all aspects of handling and storing garbage aboard the ship. Procedures for handling ship-generated garbage can be divided into four phases: Collection, processing, storage, and disposal. A generalized waste management plan for handling and disposal of ship-generated garbage is presented in Table 2. Specific procedures for each phase are discussed below.

Collection

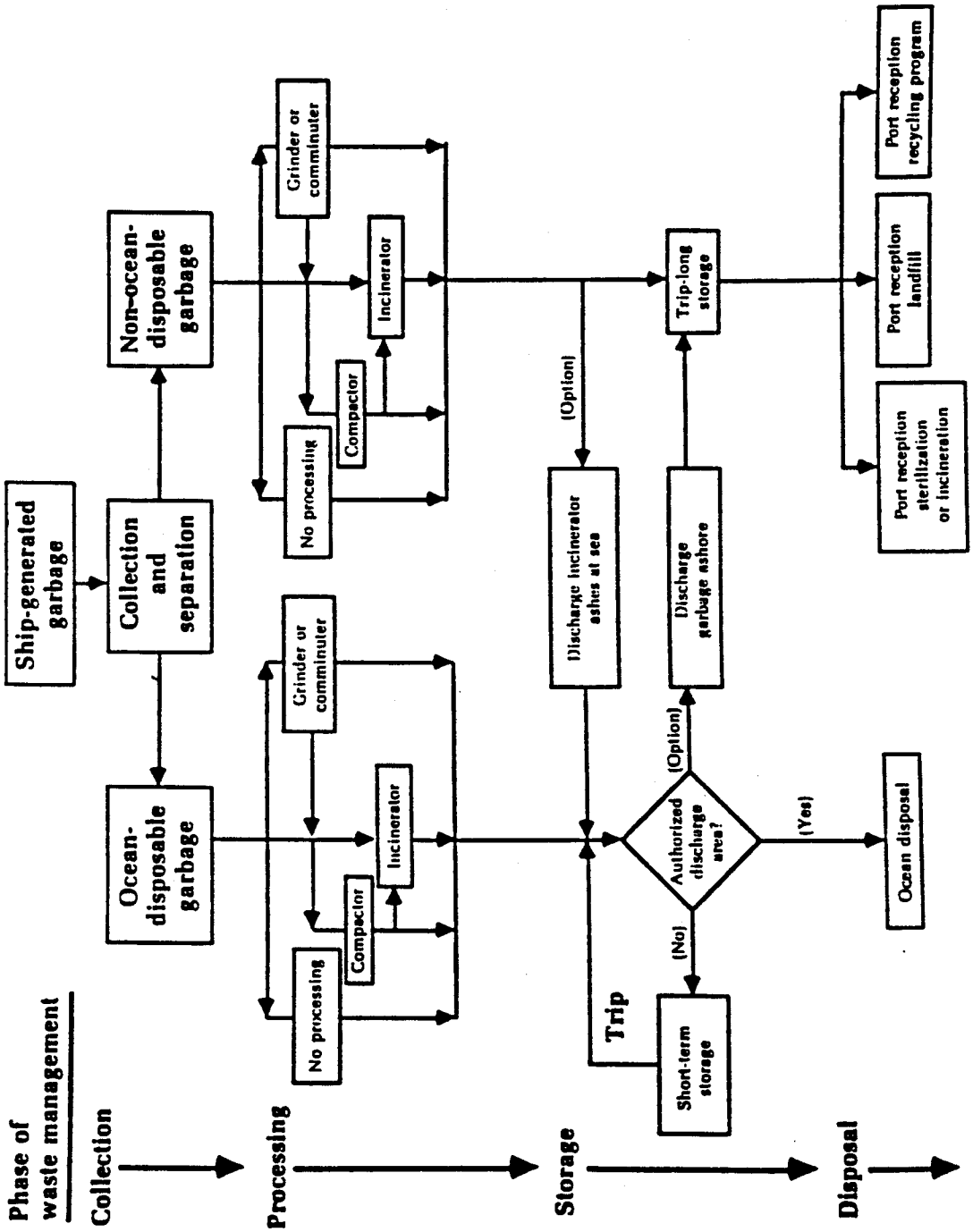
Procedures for collecting garbage generated aboard ship should be based on consideration of what can be discarded overboard while en route. To reduce or avoid the need for sorting after collection, it is recommended that three categories of distinctively marked garbage receptacles be provided to receive garbage as it is generated. These separate receptables (e.g., cans, bags, or bins) would receive (1) plastics and plastics mixed with nonplastic garbage, (2) food wastes (which includes materials contaminated by such wastes), and (3) other garbage which can be disposed of at sea. Receptacles for each of the three categories of garbage should be clearly marked and distinguishable by color, graphics, shape, size, or location. These receptacles should be provided in appropriate spaces throughout the ship (e.g., the engine room, mess deck, wardroom, galley, and other living or working spaces), and all crew members and passengers should be advised of what garbage should and should not be discarded in them. Crew responsibilities should be assigned for collecting or emptying these receptacles and taking the garbage to the appropriate processing or storage location. Use of such a system will facilitate subsequent shipboard processing and minimize the amount of garbage which must be stored aboard ship for return to port.

Separate cans or bags could be provided for receiving and storing glass, metal, plastics, paper, or other items which can be recycled. To encourage crew members to deposit such items in provided receptacles, proceeds generated from their return might be added to a ship's recreational fund.

Plastics and plastics mixed with nonplastic garbage.--Plastic garbage must be retained aboard ship for discharge at port reception facilities unless reduced to ash by incineration. When plastic garbage is not separated from other garbage, the mixture must be treated as if it were all plastic.

Synthetic fishing net and line scraps generated by the repair or operation of fishing gear may not be discarded at sea and should be

Table 2.--Options for shipboard handling and disposal of garbage.



collected in a manner that avoids its loss overboard. Such material may be incinerated, compacted, or stored along with other plastic waste, or it may be preferable to keep it separate from other types of garbage if it has strong odor or great volume.

Food wastes.--Some governments have regulations for controlling human, plant, and animal diseases that may be carried by foreign food wastes and materials that have been associated with them (e.g., food packaging and disposable eating utensils). These regulations may require incinerating, sterilizing, or other special treatment of garbage to destroy possible pest and disease organisms. Such garbage should be kept separate from other garbage and preferably retained for disposal in port in accordance with laws of the receiving country. With regard to such garbage, governments are reminded of their obligation to assure the provision of adequate reception facilities. Precautions must be taken to ensure that plastics contaminated by food wastes (e.g., plastic food wrappers) are not discharged at sea with other food wastes.

Other garbage.--Garbage in this category includes, but is not limited to, paper products, rags, glass, metal bottles, crockery, dunnage, lining, and packing materials. Vessels may find it desirable to separate dunnage, lining, and packing material, which will float, since this material is subject to a different discharge limit than other garbage in this category (Table 1). Such garbage should be kept separate from other garbage and preferably retained for disposal in port.

Oily rags and contaminated rags must be kept on board and discharged to a port reception facility or incinerated.

Recovery of garbage at sea.--Fishermen and other seafarers who recover derelict fishing gear and other persistent garbage during routine operations are encouraged to retain this material for disposal on shore. If lost pots or traps are recovered and space is not available for storage, fishermen and other seafarers are encouraged to remove and transport any line and webbing to port for disposal and return the bare frames to the water or, minimally, to cut open the traps to keep them from continuing to trap marine life.

Seafarers are further encouraged to recover other persistent garbage from the sea as opportunities arise and prudent practice permits.

Processing

Depending on factors such as the type of ship, area of operation, and size of crew, ships may be equipped with incinerators, compactors, comminuters, or other devices for shipboard garbage processing (see "Shipboard Equipment for Processing Garbage" below). Members of the crew should be assigned responsibility for operating this equipment on a schedule commensurate with ship needs. In selecting appropriate processing procedures, consider that compactors, incinerators, comminuters, and other such devices have a number of advantages, such as making it possible to discharge certain garbage at sea, reducing shipboard space requirements for storing

garbage, making it easier to off-load garbage in port, and enhancing assimilation of garbage discharged into the marine environment.

It should be noted that special rules on incineration may be established by authorities in some ports and may exist in some special areas. Incineration of the following items requires special precaution due to the potentially harmful environmental and health effects from combustion of by-products: Hazardous materials (e.g., scraped paint, impregnated wood) and certain types of plastics (e.g., polyvinyl chloride-based plastics). The problems of combustion of by-products are discussed in the section entitled "Shipboard Equipment for Processing Garbage."

Ships operating primarily in special areas or within 3 nmi of the nearest land should choose between storage of either compacted or uncompacted materials for off-loading at port reception facilities or incineration with retention of ash and clinkers. This is the most restrictive situation in that no discharge is permitted.

Compactors make garbage easier to store, to transfer to port reception facilities, and to dispose of at sea when discharge limitations permit. In the latter case, compacted garbage also may sink more readily, which would reduce aesthetic impacts in coastal waters and along beaches and perhaps reduce the likelihood of marine life ingesting or otherwise interacting with discharged materials.

Ships operating primarily beyond 3 nmi from the nearest land are encouraged to install and use comminuters to grind food wastes to a particle size capable of passing through a screen with openings no larger than 25 mm. Although larger food scraps may be discharged beyond 12 nmi, it is recommended that comminuters be used even outside this limit because they hasten assimilation into the marine environment. Because food wastes comminuted with plastics cannot be discharged at sea, all plastic materials must be removed before food wastes are ground.

Storage

Garbage collected from living and working areas throughout the ship should be delivered to designated processing or storage locations. Garbage that must be returned to port for disposal may require long-term storage depending on the length of the voyage or arrangements for off-loading (e.g., transferring garbage to an offshore vessel for incineration or subsequent transfer ashore). Garbage which may be discarded overboard may require short-term storage or no storage. In all cases, garbage should be stored in a manner which avoids health and safety hazards. The following points should be considered when selecting procedures for storing garbage:

- Ships should use separate cans, drums, boxes, bags, or other containers for short-term (disposal garbage) and trip-long (nondisposable garbage) storage. Short-term storage would be appropriate for holding otherwise disposable garbage while a ship is passing through a restricted discharge area.

- Sufficient storage space and equipment (e.g., cans, drums, bags, or other containers) should be provided. Where space is limited, vessel operators are encouraged to install compactors or incinerators. To the extent possible, all processed and unprocessed garbage which must be stored for any length of time should be in tight, securely covered containers.

- Food wastes and associated garbage which are returned to port and which may carry diseases or pests should be stored in tightly covered containers and be kept separate from garbage which does not contain such food wastes. Both types of garbage should be stored in separate, clearly marked containers to avoid incorrect disposal and treatment on land.

- Waste fishing gear can be stored on deck if materials have strong odors or if their size is too great to permit storage elsewhere on the ship. In cases where gear is fouled with marine growth or dead organisms, it may be reasonable to tow gear behind the vessel for a time to wash it out before storing. If it cannot be recovered by the vessel, the appropriate coastal state should be notified of its location.

- Disinfection and both preventive and remedial pest control methods should be applied regularly in garbage storage areas.

Disposal

Although disposal is possible under Annex V, discharge of garbage to port reception facilities should be given first priority. Disposal of ship-generated garbage must be done in a manner consistent with the regulations summarized in Table 1. When disposing of garbage, the following points should be considered:

- Garbage which may be disposed of at sea can simply be discharged overboard. Disposal of uncompacted garbage is convenient, but results in a maximum number of floating objects which may reach shore even when discharged beyond 25 nmi from the nearest land. Compacted garbage is more likely to sink and thus less likely to pose aesthetic problems. If necessary and possible, weights should be added to promote sinking. Compacted bales of garbage should be discharged over deep water (50 m or more) to prevent rapid loss of their structural integrity due to wave action and currents.

- Floating cargo-associated waste that is not plastic or otherwise regulated under other MARPOL annexes may be discharged beyond 25 nmi from the nearest land. Cargo-associated waste that will sink and is not plastic or otherwise regulated may be discharged beyond 12 nmi from the nearest land. Most cargo-associated waste is generated during the loading and unloading process, usually at

dockside. It is recommended that every effort be made to deliver these wastes to the nearest port reception facility prior to the ship's departure.

- Maintenance wastes are generated more or less steadily during the course of routine ship operations. In some cases, maintenance wastes may be contaminated with substances, such as oil or toxic chemicals, controlled under other annexes or other pollution control laws. In such cases, the more stringent disposal requirements take precedence.

- To ensure timely transfer of large quantities of ship-generated garbage to port reception facilities, it is essential for ships or their agents to make arrangements well in advance for garbage reception. At the same time, disposal needs should be identified in order to make arrangements for garbage requiring special handling or other necessary arrangements. Special disposal needs might include off-loading food wastes and associated garbage which may carry certain disease or pest organisms, or unusually large, heavy, or odorous derelict fishing gear.

Shipboard Equipment for Processing Garbage

The range of options for garbage handling aboard ships depends largely upon costs, personnel limitations, generation rate, capacity, vessel configuration, and traffic patterns. The type of equipment available to address various facets of shipboard garbage handling include incinerators, compactors, comminuters, and their associated hardware.

Grinding or Comminution

When not in a special area, the discharge of comminuted food wastes and all other comminuted garbage (except plastics and floatable dunnage, lining, and packing materials) may be permitted under Regulation 3(1)(c) of Annex V beyond 3 nmi from the nearest land. It is recommended that such comminuted or ground garbage not be discharged into a ship's sewage treatment system unless the system is approved for treating such garbage. Furthermore, it should not be stored in bottoms or tanks containing oily wastes. Such actions can result in faulty operation of sewage treatment or oily water separator equipment and can cause sanitary problems for crew members and passengers. Options for grinding or comminution include the following:

- A wide variety of food waste grinders are available in the market and are commonly fitted in most modern ships' galleys. These food waste grinders produce a slurry of food particles and water that washes easily through the required 25 mm screen. Output ranges from 10 to 250 L/min. It is recommended that the discharge from shipboard comminuters be directed into a holding tank when the vessel is operating within an area where discharge is prohibited.

- Size reduction of certain other garbage items can be achieved by shredding or crushing, and machines for carrying out this process are available for use on board ships.

Information on the development and use of comminuters for garbage aboard ships should be forwarded to the organization.

Compaction

Table 3 gives compaction information for various types of garbage.

Most garbage can be compacted; the exceptions include unground plastics, fiber- and paperboard; bulky cargo containers, and thick metal items. Pressurized containers should not be compacted since they present an explosion hazard.

Compaction can reduce the volume of garbage into bags, boxes, or briquettes. When these compacted slugs are equally formed and structurally strong, they can be piled up in building block form; this permits the most efficient use of space in the storage compartments. The compaction ratio for normal mixed shipboard garbage may range as high as 12:1.

Some of the available compactors have options such as sanitizing, deodorizing, adjustable compaction ratios, bagging in plastic or paper, boxing in cardboard (with or without plastic or waxed paper lining), and baling. Paper or cardboard tends to become soaked and weakened by moisture in the garbage during long periods of onboard storage. There have also been problems due to the generation of gas and pressure which can explode tight plastic bags.

If grinding machines are used prior to compaction, the compaction ratio can be increased and the storage space decreased.

A compactor should be installed in a compartment with adequate room for operating and maintaining the unit and storing trash to be processed. The compartment should be located adjacent to the areas of food processing and commissary storerooms. If not already required by regulations, it is recommended that the space have freshwater washdown service, coamings, deck drains, adequate ventilation, and hand or automatic fixed fire fighting equipment.

Information on the development and use of shipboard compactors should be forwarded to the organization.

Incineration

Compared to the technology of land-based incineration, the state of the art in marine incinerators is not highly advanced, primarily because the technology has not yet been subject to constraints on air emissions or on the types of materials that could be incinerated. Marine incinerators in current use are predominately designed for intermittent operation and hand stoking, and typically do not include any provisions for air pollution

Table 3.--Compaction guide for shipboard-generated garbage.

Typical examples	Special handling by vessel personnel before compaction	Compaction characteristics			Onboard storage space
		Rate of alteration	Retainment of compacted form	Density of compaction form	
Metal food and beverage containers, glass, small wood pieces	None	Very rapid	Almost 100%	High	Minimum
Comminuted plastics, fiber and paperboard	Minor--reduce material to size for feed, minimal manual labor	Rapid	Approximately 80%	Medium	Minimum
Small metal drums, uncomminuted cargo packing, large pieces of wood	Moderate--longer manual labor time required to size material for feed	Slow	Approximately 50%	Relatively low	Moderate
Uncomminuted plastics	Major--very long manual labor time to size material for feed; usually impractical	Very slow	Less than 10%	Very low	Maximum
Bulky metal cargo containers, thick metal items	Impractical for shipboard compaction not feasible	Not applicable	Not applicable	Not applicable	Maximum

control. Control of air pollution is normally required in many ports in the world. Prior to using an incinerator while in port, permission may be required from the port authority concerned. In general, the use of shipboard garbage incinerators in ports in or near urban areas should be discouraged, as their use will add to possible air pollution in these areas.

Table 4 is a guide for incineration of garbage, including combustibility, reduction of volume, residual materials, exhaust, onboard storage space, and any required special handling by vessel personnel. With the exception of metal and glass, most garbage is amenable to incineration.

In contrast to land-based incinerators, shipboard incinerators must be as compact as practicable, and with operating personnel at a premium, automatic operation is desirable. Most shipboard incinerators are designed for intermittent operation: The waste is charged to the incinerator, firing is started, and combustion typically lasts for 3 to 6 h.

Commercial marine incinerators currently available vary greatly in size, have natural or induced draft, and are hand-fired. It should be noted that incinerator ratings are usually quoted on the basis of heat input rate rather than on a weight charged basis because of the variability of the heat content in the wastes. Some modern incinerators are designed for continuous firing and can handle simultaneous disposal of nearly all shipboard waste.

Some of the advantages of the most advanced incinerators are: They operate under negative pressure, they are highly reliable since they have few moving parts, they require minimal operator skill, they are light in weight, and they have low exhaust and external skin temperatures.

Some of the disadvantages of incinerators are: The possible hazardous nature of the ash or vapor; dirty operation; excessive labor required for charging, stoking, and ash removal; and the probability of not meeting air pollution regulations imposed in certain harbors. Some of these disadvantages can be remedied by automatic equipment for charging, stoking, and discharging ash into the sea outside areas where such discharge is prohibited. The additional equipment to perform these automatic functions requires more installation space.

The incineration of predominantly plastic wastes, considered under some circumstances in complying with Annex V, requires more air and much higher temperatures for complete destruction. If plastics are to be burned in a safe manner, the incinerator should be suitable for the purpose; otherwise, the following problems can result:

- Depending on the type of plastic and conditions of combustion, some toxic gases can be generated in the exhaust stream, including vaporized hydrochloric (HCl) and hydrocyanic (HCN) acids. These and other intermediary products of plastic combustion can be extremely dangerous.

Table 4.--Incineration[a] guide for shipboard-generated garbage.

Typical examples	Special handling by vessel personnel before incineration	Incineration characteristics				Onboard storage space
		Combustibility	Reduction of volume	Residual	Exhaust	
Paper packaging, food and beverage containers	Minor--easy to feed into hopper	High	Over 95%	Powder ash	Possibly smoky and not hazardous	Minimum.
Fiber and paperboard	Minor--reduce material to size for feed; minimum manual labor	High	Over 95%	Powder ash	Possibly smoky and not hazardous	Minimum.
Plastic packaging, food and beverage containers	Minor--easy to feed into hopper	High	Over 95%	Powder ash	Possibly smoky and hazardous based on incinerator design	Minimum.
Plastic sheeting, netting, rope, and bulk material	Moderate manual labor time for size reduction	High	Over 95%	Powder ash	Possibly smoky and hazardous based on incinerator design	Minimum.
Rubber hoses and bulk pieces	Major manual labor time for size reduction	High	Over 95%	Powder ash	Possibly smoky and hazardous based on incinerator design	Minimum.
Metal food and beverage containers	Minor--easy to feed into hopper	Low	Less 10%	Slag	Possibly smoky and not hazardous	Moderate.
Metal cargo, bulky containers, thick metal items	Major manual labor time for size reduction (not easily incinerated)	Very low	Less 5%	Large metal fragments and slag	Possibly smoky and not hazardous	Maximum.
Glass food and beverage containers	Minor--easy to feed low into hopper	Low	Less 10%	Slag	Possibly smoky and not hazardous	Moderate.
Wood, cargo containers and large wood scraps	Moderate manual labor time for size reduction	High	Over 95%	Powder ash	Possibly smoky and not hazardous	Minimum.

[a]Check local rules for possible restrictions.

- The ash from the combustion of some plastic products may contain heavy metal or other residues which can be toxic and should, therefore, not be discharged into the sea. Such ash should be retained on board where possible, and discharged at port reception facilities.

- The high temperatures generated during incineration of primarily plastic wastes may damage some garbage incinerators.

Plastic incineration requires 3 to 10 times more combustion air than average municipal refuse. If the proper level of oxygen is not supplied, high levels of soot will form in the exhaust stream.

Certain ship classification societies have established requirements for the operation or construction of incinerators. The International Association of Classification Societies can provide information as to such requirements.

Information on the development and utilization of marine garbage incinerator systems for shipboard use should be forwarded to the organization.

Port Reception Facilities for Garbage

Governments are urged to initiate at the earliest opportunity studies into the provision of reception facilities at ports in their respective countries. They should carry out the studies in close cooperation with port authorities and other local authorities responsible for garbage handling. Such studies should include information such as port-by-port listing of available garbage reception facilities, the types of garbage they are equipped to handle (e.g., food wastes contaminated with foreign disease or pest organisms, large pieces of derelict fishing gear, or refuse and operational wastes only), their capacities, and any special procedures required to use them. Governments should provide the results of their studies to the organization for inclusion in the Annex V library.

While selecting the most appropriate type of reception facility for a particular part, consideration should be given to several alternative methods available. In this regard, floating plants such as barges or self-propelled ships might be considered more effective for collection of garbage in a particular location than land-based facilities.

The equipment for treatment and disposal of garbage is a significant factor in determining the adequacy of a reception facility. It not only provides a measure of the time required to complete the process, but it also is the primary means for ensuring that ultimate disposal of the garbage is environmentally safe.

Governments, in assessing the adequacy of reception facilities, should also consider the technological problems associated with the treatment and disposal of garbage received from ships. Although the establishment of

waste management standards is not within the scope of the convention, governments should take responsible actions within their national programs to consider such standards.

The methodology for determining the adequacy of a reception facility should be based on the needs of each type of ship as well as the number and types of ships using the port. The size and location of a port should be considered in determining adequacy. Emphasis should also be given to calculating the quantities of ship-generated garbage not discharged into the sea in accordance with the provisions of Regulations 3, 4, and 5 of Annex V.

Vessel, port, and terminal operators should consider the following when determining quantities of garbage on a per ship basis:

- type of garbage,
- ship type and design,
- ship operating route,
- number of persons on board,
- duration of voyage,
- time spent in areas where discharge into the sea is prohibited or restricted, and
- time spent in port.

It should be noted that reception procedures may differ, and port reception may require onboard separation of food wastes (e.g., raw meat because of risk of animal diseases), cargo-associated waste, and domestic and maintenance waste.

The purpose of these guidelines will be attained if they provide the necessary stimulus to governments to initiate and continue studies of reception facilities and of treatment and disposal technology. Information on developments in this respect should be forwarded to the organization.

Ensuring Compliance With Annex V

Recognizing that direct enforcement of Annex V regulations, particularly at sea, is difficult to accomplish, governments are encouraged to consider not only restrictive and punitive measures but also the removal of any disincentives, creation of positive incentives, and the development of voluntary measures within the regulated community when developing programs and domestic legislation to ensure compliance with Annex V.

Enforcement

Governments should encourage their flag vessels to advise them of ports in foreign countries party to Annex V which do not have port reception facilities for garbage. This will provide a basis for advising responsible governments of possible problems and calling IMO's attention to possible infractions. An acceptable reporting format is in Appendix B.

Governments should establish a documentation system (e.g., letters or certificates) for ports and terminals under their jurisdiction having adequate facilities for receiving ship-generated garbage. Periodic inspection of the reception facilities is recommended.

Governments should identify appropriate enforcement agencies providing legal authority, adequate training, funding, and equipment to incorporate the enforcement of Annex V regulations into their responsibilities. In those cases where customs of agricultural officials are responsible for receiving and inspecting garbage, governments should ensure that the necessary inspections are facilitated as much as possible.

Governments should consider, where applicable, the use of garbage discharge reporting systems for ships (e.g., existing ship's deck logbook or record books). Such logs should, at a minimum, document the date, time, location by latitude and longitude or name of port, type of garbage (e.g., food, refuse, cargo-associated waste, or maintenance waste), and estimated amount of garbage discharged. Particular attention should be given to the reporting of:

- the loss of fishing gear,
- the discharge of cargo residues,
- any discharge in special areas,
- discharge at port reception facilities, and
- discharge of garbage at sea.

The issue of documents or receipts by port reception facilities might also assist the reporting system.

Encouraging and Facilitating Compliance

The augmentation of port reception facilities to serve ship traffic without undue delay or inconvenience may require capital investment from port and terminal operators as well as the waste management companies serving those ports. Governments are encouraged to evaluate means within their authority to lessen this impact, thereby helping to ensure that garbage delivered to port is actually received and disposed of properly at reasonable costs or without charging special fees to individual ships. Such means include, but are not limited to:

- tax incentives;
- loan guarantees;
- public vessel business preference;
- special funds to assist in problem situations such as remote ports with no land-based waste management systems to receive ships' garbage;
- government subsidies and special funds to help defray the cost of a bounty program for lost, abandoned, or discarded fishing gear or other persistent garbage. The program would make appropriate payments to persons who retrieve such fishing gear or any persistent garbage other than their own from marine waters under the jurisdiction of a government.

The installation of shipboard garbage processing equipment would facilitate compliance with Annex V and lessen the burden on port reception facilities to process garbage for disposal. Therefore, governments should consider actions to encourage the installation of certain types of garbage processing equipment on ships operating under their flag. For example, programs to lessen costs of purchasing and installing compactors, incinerators, and comminuters during construction of new ships would be very helpful.

Governments are encouraged to consider the economic impacts of domestic regulations intended to force compliance with Annex V. Unrealistic regulations may lead to higher levels of noncompliance than would an education program without specific regulatory requirements beyond Annex V itself. Due to the highly variable nature of ship operations and configurations, it seems appropriate to maintain the highest possible level of flexibility in domestic regulations to permit ships the greatest range of options in complying with Annex V.

Governments are encouraged to support research and development of technology that will simplify compliance with Annex V regulations for ships and ports. This research should concentrate on:

- shipboard waste-handling systems;
- ship provision innovations to minimize garbage generation;
- loading and unloading technology to minimize dunnage, spillage, and cargo residues; and
- new ship construction design to facilitate garbage management and transfer.

Governments are encouraged to work within the organization to develop port reception systems that simplify the transfer of garbage for international vessels.

Voluntary Measures

Governments are encouraged to assist ship operators' and seafarers' organizations in developing resolutions, bylaws, and other internal mechanisms that will encourage compliance with Annex V regulations. These groups include seamen's and officers' unions, associations of ship owners and insurers and classification societies, and pilot associations and fishermen's organizations.

Governments are encouraged to assist and support where possible the development of internal systems to promote compliance with Annex V in port authorities and associations, terminal operators' organizations, stevedores' and longshoremen's unions, and land-based waste management authorities.

CONCLUSIONS

The legal framework for international cooperation in the protection of the marine environment from pollution caused by disposal into the sea of garbage from ships was given effect with the entry into force of Annex V of MARPOL 73/78 on 31 December 1988 (Marine Environment Protection Committee of the International Maritime Organization 1988).

First priority was given to the uniform implementation of Annex V through the development and enactment of enabling domestic laws. It is envisaged that the guidelines described in this paper will facilitate this process and improve the effectiveness of these measures to prevent pollution of the seas by garbage from ships.

The next step will necessarily be the encouragement of the widest possible acceptance and implementation of Annex V by states. The IMO Secretariat has integrated implementation of Annex V into its technical assistance Program for the Protection of Marine Environment. It can, therefore, be expected that global and regional workshops and seminars will be organized by IMO in cooperation with interested international and regional organizations with the aim of familiarizing experts, in particular those from developing countries, with the regulations and guidelines and providing advice on their implementation.

In 1981, the IMO assembly of its member states adopted Resolution A.500(XIII). The crux of this resolution is the agreement that it is undesirable to amend existing conventions unless they have been in force for a reasonable period of time and experience has been gained regarding the costs to the maritime industry of their operation and the burden on the legislative and administrative resources of IMO member states. The principle endorsed is that new conventions or amendments to existing conventions should be considered on the basis of a "clear and well-documented demonstration of compelling need."

After further practical experience has been gained with the implementation and enforcement of Annex V, there will doubtless be suggestions coming forth on strengthening the provisions of the annex and on further elaborating the guidelines. These suggested changes are likely to include:

- a requirement that individual waste management plans be developed for particular categories of vessels;
- a requirement that log entries be made for all waste garbage disposal practices to facilitate port control;
- requirements concerning standards of the garbage handling equipment to be installed on ships;
- a requirement concerning garbage separation on board ships; and
- guidelines on incineration of garbage on board ships.

REFERENCES

Center for Environmental Education.
1986. Use and disposal of non-biodegradable plastics in the marine and Great Lakes environments. Center for Environmental Education, Wash., D.C.

Dixon, T. R., and T. J. Dixon.
1983. Marine litter surveillance on the North Atlantic Ocean shores of Portugal and the Western Isles of Scotland. Marine Litter Research Programme, Stage 5, Keep Britain Tidy Group.

International Maritime Organization.
1988a. Guidelines for the implementation of Annex of MARPOL 73/78. (Sales No.: 5388.09E.)

1988b. Strategy for the protection of the marine environment.

Jones, R. E., S. G. Pine, M. C. Ferriter, and F. E. M. Ferriter.
1981. Sea land litter. Report of two surveys conducted by the Keep Wales Tidy Campaign into marine waste disposal practices of merchant shipping and pleasurecraft on the South Wales coastline.

Marine Environment Protection Committee of the International Maritime Organization.
1988. Marine Environment Protection Committee Resolution 31(26) adopted on 9 September 1988 and Implementation of Annexes V and IV of MARPOL 73/78. 26th Session, agenda item 10.

Vauk, G., G. Dahlmann, E. Hartwig, J. C. Ranger, B. Reineking, E. Schrey, E. Vauk-Hentzelt.
1987. Recording of oil victims on the German North Sea coast and results of oil analyses as well as investigations of burdening of the German Bight by ship's refuse. A report.

APPENDIX A

ANNEX V

REGULATIONS FOR THE PREVENTION OF POLLUTION BY GARBAGE FROM SHIPS

Regulation 1

Definitions

For the purposes of this Annex:

(1) "Garbage" means all kinds of victual, domestic and operational waste excluding fresh fish and parts thereof, generated during the normal operation of the ship and liable to be disposed of continuously or periodically except those substances which are defined or listed in other Annexes to the present Convention.

(2) "Nearest land". The term "from the nearest land" means from the baseline from which the territorial sea of the territory in question is established in accordance with international law except that, for the purposes of the present Convention "from the nearest land" off the north eastern coast of Australia shall mean from a line drawn from a point on the coast of Australia in

latitude 11°00′ South, longitude 142°08′ East to a point in latitude 10°35′ South,
longitude 141°55′ East, thence to a point latitude 10°00′ South,
longitude 142°00′ East, thence to a point latitude 9°10′ South,
longitude 143°52′ East, thence to a point latitude 9°00′ South,
longitude 144°30′ East, thence to a point latitude 13°00′ South,
longitude 144°00′ East, thence to a point latitude 15°00′ South,
longitude 146°00′ East, thence to a point latitude 18°00′ South,
longitude 147°00′ East, thence to a point latitude 21°00′ South,
longitude 153°00′ East, thence to a point on the coast of Australia in latitude 24°42′ South, longitude 153°15′ East.

(3) "Special area" means a sea area where for recognized technical reasons in relation to its oceanographical and ecological condition and to the particular character of its traffic the adoption of special mandatory methods for the prevention of sea pollution by garbage is required. Special areas shall include those listed in Regulation 5 of this Annex.

Regulation 2

Application

The provisions of this Annex shall apply to all ships.

Regulation 3

Disposal of Garbage Outside Special Areas

(1) Subject to the provisions of Regulations 4, 5, and 6 of this Annex:

(a) the disposal into the sea of all plastics, including but not limited to synthetic ropes, synthetic fishing nets and plastic garbage bags is prohibited;

(b) the disposal into the sea of the following garbage shall be made as far as practicable from the nearest land but in any case is prohibited if the distance from the nearest land is less than:

(i) 25 nautical miles for dunnage, lining and packing materials which will float;

(ii) 12 nautical miles for food wastes and all other garbage including paper products, rags, glass, metal, bottles, crockery and similar refuse;

(c) disposal into the sea of garbage specified in sub-paragraph (b)(ii) of this Regulation may be permitted when it has passed through a comminuter or grinder and made as far as practicable from the nearest land but in any case if prohibited if the distance from the nearest land is less than 3 nautical miles. Such comminuted or ground garbage shall be capable of passing through a screen with openings no greater than 25 millimetres.

(2) When the garbage is mixed with other discharges having different disposal or discharge requirements the more stringest requirements shall apply.

Regulation 4

Special Requirements for Disposal of Garbage

(1) Subject to the provisions of paragraph (2) of this Regulation, the disposal of any materials regulated by this Annex is prohibited from fixed or floating platforms engaged in the exploration, exploitation and associated offshore processing of seabed mineral resources, and from all other ships when alongside or within 500 metres of such platforms.

(2) The disposal into the sea of food wastes may be permitted when they have been passed through a comminuter or grinder from such fixed or floating platforms located more than 12 nautical miles from land and all other ships when alongside or within 500 metres of such platforms. Such comminuted or ground food wastes shall be capable of passing through a screen with openings no greater than 25 millimetres.

Regulation 5

Disposal of Garbage Within Special Areas

(1) For the purposes of this Annex the special areas are the Mediterranean Sea area, the Baltic Sea area, the Black Sea area, the Red Sea area and the "Gulfs area" which are defined as follows:

(a) The Mediterranean Sea area means the Mediterranean Sea proper including the gulfs and seas therein with the boundary between the Mediterranean and the Black Sea constituted by the 41°N parallel and bounded to the west by the Straits of Gibraltar at the meridian of 5°36'W.

(b) The Baltic Sea area means the Baltic Sea proper with the Gulf of Bothnia and the Gulf of Finland and the entrance to the Baltic Sea bounded by the parallel of the Skaw in the Skagerrak at 57°44.8'N.

(c) The Black Sea area means the Black Sea proper with the boundary between the Mediterranean and the Black Sea constituted by the parallel 41°N.

(d) The Red Sea area means the Red Sea proper including the Gulfs of Suez and Aqaba bounded at the south by the rhumb line between Ras si Ane (12°8.5'N, 43°19.6'E) and Husn Murad (12°40.4'N, 43°30.2'E).

(e) The "Gulfs area" means the sea area located north west of the rhumb line between Ras al Hadd (22°30'N, 59°48'E) and Ras al Fasteh (25°04'N, 61°25'E).

(2) Subject to the provisions of Regulation 6 of this Annex:

(a) disposal into the sea of the following is prohibited:

(i) all plastics, including but not limited to synthetic ropes, synthetic fishing nets and plastic garbage bags; and

(ii) all other garbage, including paper products, rags, glass, metal, bottles, crockery, dunnage, lining and packing materials;

(b) disposal into the sea of food wastes shall be made as far as practicable from land, but in any case not less than 12 nautical miles from the nearest land.

(3) When the garbage is mixed with other discharges having different disposal or discharge requirements the more stringest requirements shall apply.

(4) Reception facilities within special areas:

(a) The Government of each Party to the Convention, the coastline of which borders a special area undertakes to ensure that as soon as possible in all ports within a special area, adequate reception facilities are provided in accordance with Regulation 7 of this Annex, taking into account the special needs of ships operating in these areas.

(b) The Government of each Party concerned shall notify the Organization of the measures taken pursuant to sub-paragraph (a) of this Regulation. Upon receipt of sufficient notifications the Organization shall establish a date from which the requirements of this Regulation in respect of the area in question shall take effect. The Organization shall notify all Parties of the date so established no less than twelve months in advance of that date.

(c) After the date so established, ships calling also at ports in these special areas where such facilities are not yet available, shall fully comply with the requirements of this Regulation.

Regulation 6

Exceptions

Regulations 3, 4 and 5 of this Annex shall not apply to:

(a) the disposal of garbage from a ship necessary for the purpose of securing the safety of a ship and those on board or saving life at sea; or

(b) the escape of garbage resulting from damage to a ship or its equipment provided all reasonable precautions have been taken before and after the occurrence of the damage, for the purpose of preventing or minimizing the escape; or

(c) the accidental loss of synthetic fishing nets or synthetic material incidental to the repair of such nets, provided that all reasonable precautions have been taken to prevent such loss.

Regulation 7

Reception Facilities

(1) The Government of each Party to the Convention undertakes to ensure the provision of facilities at ports and terminals for the reception of garbage, without causing undue delay to ships, and according to the needs of the ships using them.

(2) The Government of each Party shall notify the Organization for transmission to the Parties concerned of all cases where the facilities provided under this Regulation are alleged to be inadequate.

APPENDIX B

FORM FOR REPORTING ALLEGED INADEQUACY OF PORT RECEPTION FACILITIES FOR GARBAGE

1. Country
   Name of port or area
   Location in the port (e.g., berth/terminal/jetty)
   Date of incident

2. Type and amount of garbage for discharge to facility:

   a. Total amount (m^3):

      Food waste
      Cargo-associated waste
      Maintenance waste
      Other

   b. Amount not accepted by the facility (m^3):

      Food waste
      Cargo-associated waste
      Maintenance waste
      Other

3. Special problems encountered:

      Undue delay
      Inconvenient locality of facilities
      Unreasonable charges for use of facilities
      Use of facility not technically possible
      Special national regulations
      Other

4. Remarks: For example, information received from port authorities or operators of reception facilities, reasons for nonacceptance (2.b above).

5. Ship's particulars:

      Name of ship
      Owner or operator
      Distinctive number or letters
      Port of registry
      Number of persons on board

_____ _____

Date of completion of form Signature of master

REDRESSING THE PROBLEM OF PERSISTENT MARINE DEBRIS THROUGH LAW AND PUBLIC POLICY: OPPORTUNITIES AND PITFALLS

Michael J. Bean
Wildlife Program
Environmental Defense Fund
Washington, D.C. 20036, U.S.A.

ABSTRACT

This paper explores a variety of legal and institutional authorities for redressing the problems of persistent plastic debris in ocean environments. A major focus is on the recently ratified Annex V of the International Convention for the Prevention of Pollution by Ships (MARPOL) and its implementing legislation in the United States, the Marine Plastic Pollution Research and Control Act of 1987. The U.S. Coast Guard's new implementing regulations are described and critiqued, and important problems in the initial implementation of these new requirements analyzed.

The discussion of MARPOL and its initial implementation will introduce two related concerns. The first is the potential for solutions to the persistent debris problem to create an entirely different set of environmental problems. For example, the apparent intention of many shipping interests to turn to on-board incineration as the preferred means of complying with MARPOL's prohibition against the disposal at sea of plastics creates potential new problems in the form of hazardous air emissions and disposal of ash at sea. The limited legal authorities for responding to those potential problems under the Resource Conservation and Recovery Act, section 311 of the Clean Water Act, and other laws are described.

A further example is the fact that the enormous public attention to the problems associated with persistent plastic debris in the oceans and elsewhere has stimulated much interest in requiring "degradable" plastics before very much is known about the environmental hazards of the products of degradation and the impact of degradability upon efforts to recycle plastics. Some of the recently enacted laws and pending legislation relating to degradable plastics are reviewed.

The second consideration raised by the discussion of MARPOL is the difficulty of addressing the problem of marine plastic pollution as a problem separate from the larger problem of the

---

In R. S. Shomura and M. L. Godfrey (editors), Proceedings of the Second International Conference on Marine Debris, 2-7 April 1989, Honolulu, Hawaii. U.S. Dep. Commer., NOAA Tech. Memo. NMFS, NOAA-TM-NMFS-SWFSC-154. 1990.

proliferating use of plastics generally. The paper concludes with an appraisal of opportunities to redress marine plastic pollution by public policy measures that touch upon that problem only indirectly in the context of designing sensible overall solid waste disposal programs. Some of the key public policy issues before Congress and local legislative bodies with important implications for plastics will be addressed.

INTRODUCTION

The first international conference on marine debris (Shomura and Yoshida 1985) was a major catalyst for a startling array of legislative and public policy initiatives to address a suddenly critical environmental problem that few had previously considered to be a problem at all. This paper examines some of the more important of these initiatives, pointing out their potential for reducing the marine debris problem, their limitations, and their possible pitfalls in terms of exacerbating other environmental problems. Finally, while the focus of the original symposium was on plastics in the marine environment, it has become increasingly clear that plastics present a variety of environmental problems, not simply in the marine environment, but elsewhere as well. As a result of this fact, this paper argues that the most significant benefits to the marine environment may come about as a result of measures that are aimed at addressing the broader set of problems for which plastics generally are responsible.

MARPOL ANNEX V

Undoubtedly, the most significant public policy advance since the 1984 conference pertains to Annex V of the International Convention for the Prevention of Pollution from Ships, better known simply as MARPOL. As a result of the subsequent ratification of MARPOL Annex V by the United States, the Soviet Union, and a number of other countries, that international agreement banning the disposal at sea of vessel-generated plastic waste came into force on 31 December 1988. In the United States, legislation to implement Annex V and, in certain respects, to impose duties beyond those of Annex V itself, was enacted in late 1987. Most of the duties imposed by that legislation, the Marine Plastic Pollution Research and Control Act of 1987 (MPPRCA), were to take effect concurrently with the coming into force internationally of MARPOL Annex V. However, the U.S. Coast Guard has thus far published only proposed regulations to implement the new legislation. Until final regulations are promulgated, the duties imposed by MARPOL Annex V and its U.S. implementing legislation are in a sort of regulatory limbo.

Before turning to the issues that have slowed the promulgation of implementing regulations, let us review first what MARPOL Annex V is intended to do. Put simply, MARPOL Annex V, in tandem with the London Dumping Convention, makes unlawful the deliberate disposal at sea of persistent plastics. The MARPOL Annex V picks up where the London Dumping Convention leaves off; the latter prohibits the dumping of plastics from

sources other than the routine operation of the vessel itself; MARPOL Annex V, on the other hand, restricts the disposal of vessel-generated wastes at sea, requiring that certain types of waste be disposed of beyond specified distances from land and prohibiting altogether the disposal at sea of other types of waste, including all plastics. Since, from time immemorial, it has been the nearly universal practice of ships at sea to dispose of their own wastes overboard, and since plastics represent a rapidly growing fraction of the shipboard waste stream, MARPOL Annex V has the potential to reduce a significant source of marine plastic debris. How significant this source is for the most serious environmental problems associated with marine plastic debris and how much of MARPOL'S potential to cut into this source will actually be realized are still very much matters of conjecture.

In retrospect, considering the dramatic changes that MARPOL Annex V was intended to effect in the long established practices of ships at sea, it is remarkable how little controversy attended the U.S. ratification of Annex V and enactment of domestic implementing legislation for it. No significant opposition to either measure was voiced at congressional hearings, there were no contested floor amendments offered in either house of Congress, and both houses approved the legislation by unrecorded voice vote, indicating the absence of any serious opposition or controversy. Either the interests that were to be affected by the legislation had carefully considered its potential impact and concluded that those impacts were acceptable, or those interests simply failed to take notice that legislation with potentially far-reaching consequences was zipping through Congress with uncharacteristic speed. The subsequent anxieties expressed by parts of the shipping industry during the course of Coast Guard rule making incline me toward the latter explanation.

The first noteworthy aspect of MARPOL Annex V is its extraordinary scope. Prior to the coming into force of Annex V, MARPOL affected only a few large ships, the oil and chemical tankers whose operations are subject to regulation under Annexes I or II, the mandatory MARPOL annexes. Annex V, on the other hand, applies literally to "all ships," save for warships and other government-owned or operated ships being used for government noncommercial service. Thus, not just major merchant vessels, but also commercial fishing vessels, cruise liners, recreational craft, and even rowboats and canoes are subject to Annex V's proscriptions. Moreover, the U.S. domestic implementing legislation goes beyond Annex V's already broad scope by requiring military and other government vessels to comply fully within 5 years after MARPOL enters into force (i.e., by 31 December 1993).

The domestic implementing legislation expands Annex V's geographic scope as well. Whereas Annex V applies only to ships at sea, the MPPRCA applies to vessels in U.S. internal waters as well. Both foreign and U.S. vessels are subject to the U.S. law while in navigable waters or the exclusive economic zone (EEZ) of the United States. United States vessels remain subject to the proscriptions of the U.S. law wherever they may be, even beyond the U.S. EEZ. With respect to penalties for violations, MARPOL itself requires only that these "be adequate in severity to discourage violations." The U.S. implementing legislation fixes very high maximum criminal and civil penalties for violations of Annex V; indeed, they are

the same as those for violations of Annex I or II involving oil or noxious liquid substances. A knowing violation of any of the MARPOL annexes, the requirements of the implementing legislation, or regulations adopted thereunder may be punished by a fine of up to $50,000 per offense and up to 5 years in prison. A civil penalty of up to $25,000 may also be assessed for any violation of the above.

Clearly, MARPOL Annex V and its implementing legislation in the United States represent, on paper at least, a major commitment to eliminating at least one source of marine plastic debris. How will it work in practice? MARPOL Annex V does not tell a vessel operator what he should do with ship-generated plastic waste--it only tells him that he cannot dispose of it in the ocean. The Coast Guard, charged with developing regulations to implement Annex V and the MPPRCA, has not sought through those regulations to steer vessel operators in any particular direction. Rather, it too leaves up to each individual operator the decision of what to do with plastic waste.

Implicitly, there is in Annex V a sort of presumption that the best solution is to off-load any plastic waste in port. This is because Annex V not only restricts the trash disposal practices of ships, but also requires that there be adequate reception facilities for garbage at ports and terminals. There is a rather obvious ambiguity here, in that most nonplastic garbage can still be disposed of at sea. Thus, it is unclear whether to be "adequate" a reception facility must be capable of handling only ship-generated plastic waste (the only waste that cannot be disposed of at sea), or whether it must be capable of handling the much larger volume of other garbage that might--or might not--be brought back to port.

On this issue, the Coast Guard's proposed regulations basically punt. The proposed regulations include a recommended "worksheet" for estimating the likely quantity of garbage that a port or terminal may be expected to handle, but then go on to disavow the likely accuracy of the formulas in the worksheet and any intention to rely upon those formulas in determining whether a port or terminal has met its obligation to provide adequate reception facilities. Indeed, the proposed regulations rely upon a system of self-certification, and require such self-certification for only a limited number of ports, principally those that already receive ships subject to Annexes I or II. Moreover, the proposed regulations do not even require that in certifying its reception facilities as adequate, a port or terminal identify what those facilities are.

VESSEL RESPONSE: INCINERATION AT SEA

Now, if you are a ship owner, you might at this point begin to get a bit nervous. The Coast Guard's proposed regulations were published on 27 October; Annex V was scheduled to come into force just 9 weeks later. As of that time it would no longer be lawful to dispose of plastic trash at sea, yet the availability of adequate reception facilities in port to handle any trash brought back to port had to be taken on faith. It was very clear that many of the larger shipping interests did not have that faith. In a number of public and private forums connected with the Coast

Guard rule making, two sentiments were very clearly expressed by these interests. The first was that 31 December 1988, was simply too soon to expect effective compliance with Annex V's new requirements for both ships and ports. The second was that in order to guard against the contingency that ports and terminals might in fact not have the ability to handle ship-generated garbage expeditiously or at all, larger ships would have to take care of their waste disposal problems by themselves by installing shipboard incinerators. It was rather remarkable, given the expense, potential danger, and generally primitive technology of shipboard incinerators, that installation of incinerators was the first alternative many shipping interests chose to explore, while reduction or elimination of optional plastics aboard ship seemed scarcely to have been considered.

It is unclear at this juncture just how much use of shipboard incineration will be stimulated by MARPOL Annex V, but it is very clear that it has stimulated a great deal of consideration of that option as a way of complying with the annex. Whether at-sea incineration of plastics represents a net environmental gain or merely solves one environmental problem by creating another is an open question. The Coast Guard, in its notice of proposed rule making, acknowledged that "proper disposal of incinerator ash has not been fully studied," but advised that for purposes of Annex V, ash is to be treated as operational waste that can be disposed of in the ocean beyond 3 nmi from shore. Rather more cautious advice can be found in the Guidelines for the Implementation of Annex V adopted by the Marine Environment Protection Committee of the International Maritime Organization in September 1988. Those guidelines, which are advisory only, state that the "ash from the combustion of some plastic products may contain heavy metal or other residues which can be toxic and should therefore not be discharged into the sea. Such ashes should be retained on board, where possible, and discharged at port reception facilities."

Even the more cautionary advice found in the guidelines probably understates the likelihood that incinerator ash will contain toxic heavy metals. About half of the tests that have been done of mixed bottom and fly ash, and virtually all of the tests of fly ash alone from municipal incinerators have found levels of lead or cadmium or both that exceed U.S. Environmental Protection Agency (EPA) criteria for designating such material as "hazardous waste" under the Federal Resource Conservation and Recovery Act (RCRA) (Denison and Silbergeld 1988). Plastics, some of which use lead or cadmium as stabilizers and colorants, are believed to be a major source of both of those heavy metals in municipal incinerator ash. Indeed, a recent study indicates that plastics account for 71% of the lead and 88% of the cadmium in the combustible portion of the municipal solid waste stream (Franklin Associates 1989).

The above percentages are all the more remarkable, given that plastics represent only about 7% (by weight) of the municipal solid waste stream. There is every reason to expect plastics to comprise an even greater percentage of the waste stream fed into an onboard incinerator, since it is only plastics that cannot otherwise be disposed of at sea. Thus, while lead and cadmium levels are generally high enough in municipal incinerator ash to be considered hazardous, even higher levels appear quite likely in

ash from shipboard incinerators. If that ash were brought to shore, it might have to be disposed of as hazardous waste under the RCRA. Since RCRA's reach does not extend beyond 3 nmi from shore, however, neither it nor MARPOL prohibits the disposal of the same ash directly into the sea. Section 311 of the Clean Water Act authorizes the EPA to prohibit the discharge of hazardous substances into the contiguous zone of the United States, but incinerator ash is not yet among the substances designated as hazardous under this authority.

Incineration of plastics at sea presents not only the problem of disposing of ash, but also that of controlling atmospheric emissions. Land-based incinerators are typically equipped with sophisticated technology to capture harmful flue gases and reduce particulate emissions. Emissions from land-based incinerators are closely regulated under authority of the Clean Air Act. Onboard incinerators, because of their smaller size, shorter stacks, and other limitations, are unlikely to be equipped with any sort of emission control equipment; in any event, inasmuch as vessels at sea are outside the scope of the Clean Air Act, they will not be required to control their emissions. Yet, the incineration of some plastics, in particular polyvinyl chloride, produces highly toxic, corrosive gases.

Whether widespread conversion to at-sea incineration of plastics will create a new set of environmental problems is open to debate. What is clear is at least the potential for solutions to one problem to become themselves the source of another problem. Just as the long distance transport of acid rain-causing sulphur oxides was the unforeseen result of building higher and higher emission stacks to reduce local air pollution problems, so too might some of the solutions to the environmental problems of plastic debris cause other, largely unforeseen problems.

DEGRADABLE PLASTICS

Let me illustrate this with a discussion of a very hot topic--"degradable" plastics. The concern with the problem of marine plastic pollution has helped trigger what can only be described as an avalanche of interest among public policy makers in the subject of degradable plastics. The MPPRCA of 1987 does not merely implement MARPOL Annex V. It also directs EPA to carry out a study of the adverse environmental effects of plastics generally, and to evaluate the feasibility of making products that present a particular hazard to the environment from "degradable plastics materials." Less than a year later, in October 1988, Congress passed another law, Public Law No. 100-556, requiring EPA, within 2 years thereafter, to issue regulations requiring that "plastic ring carriers" be made of "naturally degradable material" unless doing so is infeasible or will result in byproducts of degradation that present a greater threat to the environment. Only a month earlier, Congress included in the Defense Department Authorization Act, Public Law No. 100-456, a provision (section 352) directing the Secretary of Defense to report to Congress by 1 March 1990 his recommendations concerning the substitution of "degradable plastic items for nondegradable plastic items" used by the military. The Senate also passed Senate Resolution 412, a nonbinding resolution

expressing the sense of the Senate that EPA should encourage the use of biodegradable plastic bags and other items through its regulatory and informational programs.

In addition to these enacted measures, there were also a number of other bills introduced in the last Congress that would have mandated either the study of, or use of, degradable plastics for a variety of purposes. In the new Congress, interest will almost certainly be even higher. At the state level, degradable plastics are required for beverage ring carriers in at least 17 states and for still other products in a number of states. Corn-growing states in particular have an interest in pushing degradable plastic requirements, since at least some of the technologies for producing degradable plastic utilize corn starch as the ingredient that imparts degradability. Thus, it came as no great surprise to me to learn recently that the incoming chairman of the National Governor's Association, the Governor of Iowa, has degradable plastics near the top of the environmental agenda that he wants the association to pursue.

The rush to impose degradable plastic requirements has far outpaced any reasonable understanding of the extent to which degradable plastics are actually likely to contribute to the solution of current environmental problems and the likelihood that they might exacerbate others or create altogether new ones. Some of the promoters of degradable plastics have argued that products that might otherwise entangle marine animals will be so weakened that they will be readily broken. One seldom hears acknowledged, however, that those same products, and others that never presented any entanglement threat, may, by virtue of their gradual breakdown into multiple fragments, be far more likely to contribute to the problem of ingestion than they would have done had they remained intact. As for the chemical products of degradation, the discussions to date have rarely included mention of the fact that heavy metals and other toxic chemicals are commonly used as plasticizers, stabilizers, catalysts, and colorants in a wide variety of plastics. While a plastic product remains intact, these are relatively inaccessible to the environment. As that product degrades into ever smaller pieces and shorter polymer chains, however, these same chemicals are likely to become much more accessible to the environment. My point is not to say that, on balance, degradable plastics represent a greater environmental threat than nondegradable plastics; rather, it is only to say that no one yet knows what trade-offs are involved, yet the rush by many legislators to embrace degradable plastics has nearly become a stampede.

If degradable plastics are an unlikely panacea for the problem of marine plastic pollution, what other measures beyond MARPOL itself offer some hope of redressing the problem? The limitations of MARPOL Annex V are apparent. Even assuming widespread voluntary compliance with, and effective enforcement of, its prohibitions--and such assumptions are not easily indulged--MARPOL Annex V at best only addresses a fraction of the problem. It does not touch at all the problem of lost or damaged fishing gear, or marine plastic waste that can be traced back to beach litter, storm water runoff, sewage disposal, spills associated with marine transfer of municipal waste, factory discharges into inland waters and estuaries,

and other essentially land-based sources. All water runs downhill, and at the bottom of all those hills lies the ocean. Add to this diversity of sources of marine plastic pollution the fact that the incredible penetration of the market by more and more plastic products continues unabated, and it is not difficult to look upon the task of protecting the oceans from plastic debris as a job suited for Sisyphus.

PLASTICS IN THE SOLID WASTE STREAM

What public policy alternatives exist for making additional inroads into the marine plastic pollution problem? At least part of the answer, it seems likely, will derive from the eventual recognition that the problem of marine plastic debris is but one facet of a much larger set of problems stemming from the growing abundance of plastics in the solid waste stream.

Plastics present a number of unique problems, not just for living marine organisms, but for human communities struggling with the growing solid waste crisis. As already noted, plastics are primary contributors of some of the heavy metals in municipal incinerator ash that may cause that ash to be treated--and very expensively--as hazardous waste. In addition, the very low level of plastics recycling frustrates effective solid waste management programs.

Increasingly, many communities are recognizing that the most economical and environmentally sound response to the growing solid waste problem is to include an aggressive recycling component in their solid waste management programs. Yet, plastics in the waste stream are, by and large, replacing the very glass and metal containers that enjoy some of the highest recycling rates. Pressed on one side by the prospect of diminishing landfill capacity and on the other by the high cost of building and operating incinerators, many states and local governments are enacting laws that prescribe some minimum level of recycling of the overall municipal solid waste stream--typically at least 25% and sometimes twice that. Achieving those prescribed rates will be difficult unless either the amount of plastic in that stream is limited or the extent of plastics recycling dramatically increases. A number of communities are already trying to accomplish the former by prohibiting certain types of plastic packaging or by imposing differential taxes on certain products, with a higher tax on those made from materials not readily recycled. Suffolk County, New York, is an example. Its law prohibiting plastic bags and certain fast food packaging is serving as something of a test for how far local communities can go in banning plastic products. The plastics industry does not take this lightly. It has challenged the Suffolk County law in a New York trial court in a case entitled Society of the Plastics Industry v. County of Suffolk; the Environmental Defense Fund and the Natural Resources Defense Council have intervened in support of the county law.

Laws like that of Suffolk County are likely to become increasingly common unless dramatic strides in the recycling of plastics are made very soon. Of the more than 9 million MT (20 billion lb) of plastic in the municipal solid waste stream in 1986, only 68,000 MT (150 million lb), or

<1%, was recycled (EPA 1989). By contrast, more than 26% of paper and paperboard, and more than 50% of aluminum cans are recycled (EPA 1989). Virtually the only plastic product with a more than negligible recycling rate is the PET (polyethylene terephthalate) soft-drink bottle. However, returnable deposit legislation, which currently exists in only 10 states, represents the only significant means through which plastic bottles are currently being collected for recycling (EPA 1989). In Michigan, which has a required 10 cent deposit, the recovery rate is nearly 90%. In states without mandatory deposit legislation, there is virtually no recycling of plastic bottles. Thus, if the plastics industry wanted to give a real boost to recycling, it would break ranks with the bottling industry and support state mandatory deposit legislation.

In the long run, the amount of plastic debris in the marine environment is likely to be a function not merely of the waste disposal practices of vessels at sea, but of the laws and public policy measures that influence how much further growth of the plastics market will occur and how plastics in the solid waste stream generally are treated. Measures to mandate or encourage reusable or recyclable products, to limit product packaging, or to encourage nonplastic alternatives may ultimately contribute as much or more to the solution of the marine plastic debris problem as measures aimed directly at marine industries.

REFERENCES

Denison, R. A., and E. K. Silbergeld.
1988. Risks of municipal solid waste incineration. Risk Analysis 8(33).

Environmental Protection Agency.
1989. Draft report to Congress under the Marine Plastic Pollution Control Act.

Franklin Associates, Ltd.
1989. Characterization of products containing lead and cadmium in municipal solid waste in the United States, 1970 to 2000, a report to the Environmental Protection Agency.

Shomura, R. S., and H. O. Yoshida (editors).
1985. Proceedings of the Workshop on the Fate and Impact of Marine Debris, 26-29 November 1984, Honolulu, Hawaii. U.S. Dep. Commer., NOAA Tech. Memo. NMFS, NOAA-TM-NMFS-SWFC-54, 580 p.

IMPLEMENTATION AND ENFORCEMENT OF ANNEX V OF MARPOL 73/78 IN THE UNITED STATES

Raymond E. Seebald
Commandant (G-MPS-1)
U.S. Coast Guard Headquarters
Washington, D.C. 20593, U.S.A.

ABSTRACT

A new, bold international law entered into placed on 31 December 1988 in response to the threat to the marine environment posed by marine debris. Annex V of MARPOL 73/78, as it is known, is the first international agreement to attempt to reduce the amounts of plastics and other garbage waste discharged into the oceans from vessels. The U.S. Coast Guard's role was to interpret broad international guidelines and directives by Congress as stated in the Marine Plastic Pollution Research and Control Act of 1987, and develop practical enforceable regulations. These regulations which were developed reflect both the Coast Guard's expertise in enforcing Annexes I and II of MARPOL 73/78, and the numerous comments received from industry and the environmental and public sectors. The resulting performance-based regulations left the details of compliance up to vessels, which were required to restrict their discharge of garbage, and to the terminals and ports, which were required to provide reception facilities for the garbage wastes. Vessels have employed numerous different strategies to comply with the regulations. These strategies range from different operational methods to the installation of large garbage-treating equipment, based on the route, passenger load, type of trade, and size of vessel. Port facilities have applied an equally diverse response to compliance.

The Coast Guard's enforcement of these regulations involves a multiagency effort. The Department of Agriculture and the National Marine Fisheries Service, NOAA, conduct enforcement in areas of their own influence and expertise. The Coast Guard expects that these enforcement strategies together with educational efforts by local captains of the port should result in a high compliance rate on the part of the shipping community.

In R. S. Shomura and M. L. Godfrey (editors), Proceedings of the Second International Conference on Marine Debris, 2-7 April 1989, Honolulu, Hawaii. U.S. Dep. Commer., NOAA Tech. Memo. NMFS, NOAA-TM-NMFS-SWFSC-154. 1990.

THE COAST GUARD'S ANNEX V COMPLIANCE REPORT: A CASE STUDY

Carl A. Crampton
U.S. Coast Guard (G-MPS-3)
Washington, D.C. 20593, U.S.A.

ABSTRACT

This case study documents the U.S. Coast Guard process for accomplishing the congressional mandate for a compliance report concerning the implementation of Annex V (Regulations for the Prevention of Pollution by Garbage from Ships) of MARPOL 73/78. Annex V was implemented by Title II of Public Law 100-220, the Marine Plastic Pollution Research and Control Act of 1987.

The study follows the development of an empirical methodology for assessing compliance with new regulations that implement Annex V. The goal is a report that measures the amount of Annex V garbage being brought ashore both before and after Annex V became effective. As a secondary objective, the Coast Guard would like to assess the effects of Annex V regulations on the coastal and marine environments. The project involves an evaluation of current information and its statistical validity as a preimplementation baseline. The evaluation is then used to develop a baseline estimate for the amount of Annex V garbage being generated. Once that information has been collected, a methodology for measuring Annex V compliance and for assessing the effects of Annex V regulations on the coastal and marine environments will be developed.

The Coast Guard must follow specific congressional intent for the compilation of this report. Congress required in section 2201, Title II of PL 100-220, that within 1 year from the date of enactment of the act, and every 2 years thereafter for a period of 6 years, the Coast Guard, in consultation with the Secretary of Agriculture and the Secretary of Commerce, report to them on compliance with Annex V in U.S. waters, including the waters of the U.S. exclusive economic zone. The report is to include a description of the enforcement mechanisms in place and an assessment of the need for additional enforcement authority. It must also address the extent to which garbage reception facilities have been made available at the ports, and the mechanisms used by the Coast Guard to ensure that these facilities are made available as required by Annex V.

In R. S. Shomura and M. L. Godfrey (editors), Proceedings of the Second International Conference on Marine Debris, 2-7 April 1989, Honolulu, Hawaii. U.S. Dep. Commer., NOAA Tech. Memo. NMFS, NOAA-TM-NMFS-SWFSC-154. 1990.

In preparing this report, the Coast Guard must assess the extent to which vessels dispose of floatable dunnage materials beyond 25 nmi from shore and the extent to which they wash ashore, and recommend whether Annex V should be amended to prohibit the disposal of these materials at sea. The report must also include a detailed assessment of the fines levied by foreign nations for violations of Annexes I, II, and V committed by foreign flag vessels in the U.S. exclusive economic zone. Finally, the report must summarize the education efforts undertaken to inform the public of the problem of pollution of the marine environment by improperly disposed garbage.

HISTORY OF ENACTMENT

MARPOL 73/78

The International Convention for the Prevention of Pollution from Ships, 1973, as amended by the Protocol of 1978 (MARPOL 73/78), established baseline levels of practice in attempting to mitigate or eliminate damage to the environment by pollution from vessels. The MARPOL 73/78 is built of five annexes. Each annex is concerned with preventing pollution of the world's oceans by a different product or group of products. Annex I is concerned with preventing oil pollution, Annex II with the noxious liquid substances or chemicals, Annex III with the release of packaged hazardous materials, Annex IV deals with the prevention of pollution by sewage, and Annex V with the prevention of pollution by garbage. Annexes I and II are mandatory for signatories, while Annex III, IV, and V are optional, only becoming effective 1 year from the date when at least 15 nations have ratified them. The 15 nations must represent a cumulative total of 50% of world shipping tonnage.

The Act to Prevent Pollution From Ships

Domestic legislation was needed to implement the convention and its annexes in the United States. The MARPOL 73/78 was incorporated into U.S. law when the Act to Prevent Pollution from Ships was passed by the Congress of the United States in 1980. (For a more complete description of this process, see Whitehead 1988.) The Act to Prevent Pollution from Ships was codified in Title 33, United States Code, Sections 1901-1910.

The Marine Plastic Pollution Research and Control Act of 1987

Scientific and environmental forums during the 1970's and 1980's highlighted the amount and impact of garbage from ships on the world's oceans. Although ocean disposal of any type of garbage presents the potential for environmental damage, plastics seemed to be the most immediate problem. The characteristics of plastics which make them useful: lightweight, strong, and persistent, make them deadly to the ocean's biota. Title II of Public Law 100-220, the Marine Plastic Pollution Research and Control Act (MPPRCA) of 1987, implemented Annex V of MARPOL 73/78. Annex V prohibits the discharge of any plastic materials from ships at sea, limits the locations

where other garbage may be discharged, and requires signatories to provide reception facilities for the discharge of ships' garbage. Title II includes additional requirements for Annex V's implementation in the United States. One of those requirements is a report on compliance with the new law's requirements.

COMPLIANCE REPORT REQUIREMENTS

Provisions in the Law

Congress mandated in the law that "within 1 year after the effective date of this section, and biennially thereafter for a period of 6 years, the Secretary of the Department in which the U.S. Coast Guard is operating, in consultation with the Secretary of Agriculture and the Secretary of Commerce, shall report to the Congress regarding compliance with Annex V to the International Convention for the Prevention of Pollution from Ships, 1973, in United States waters" (P.L. 100-220).

The Congressional Record elaborated on this reporting requirement (U.S. Congress 1987). The report is required to include a description of the enforcement mechanisms in place and an assessment of the need for additional enforcement authority. It is to address the extent to which garbage reception facilities have been made available at the ports, and the mechanism used by the U.S. Coast Guard to ensure that these facilities are made available as required by Annex V. In preparing this report, the Coast Guard is to assess the extent to which vessels dispose of floatable dunnage materials beyond 25 nmi from shore and the extent to which they wash ashore, and to recomend whether Annex V should be amended to prohibit the disposal of these materials at sea. The report is to provide a detailed assessment of the fines levied by signatory nations for violations of Annexes I, II, and V by their vessels in the U.S. exclusive economic zone. Finally, the report is required to summarize the education efforts undertaken to inform the public of the problem of pollution of the marine environment by garbage that is improperly disposed of.

The Coast Guard is to solicit the advice of interested parties, including the shipping industry, ports, the commercial fishing industry, environmental groups, waste handling firms, and recreational boaters, in preparing this report. The input of industry and environmental groups is to be solicited through existing forums such as the Workshop on National Marine Pollution Problems and Needs conducted by the National Marine Pollution Planning Office of the U.S. National Oceanic and Atmospheric Administration (NOAA); the Marine Debris Roundtable, a national discussion group informally established by NOAA; the National Committee for the Prevention of Pollution, a subcommittee of the Shipping Coordinating Committee, which meets in advance of meetings of the Marine Environmental Protection Committee of the International Maritime Organization; and the National Boating Safety Advisory Council, an advisory committee to the Coast Guard that considers matters affecting recreational boating.

Completing the Feedback Loop

The Coast Guard wants to present a complete picture to Congress in the report. The current report requirements include information on violations, facilities available, and other enforcement information. However, it does not require relative measures against which enforcement data can be viewed. The Coast Guard compiled information on various vessel classes and their contribution to the garbage load in the oceans as a required portion of the regulatory process. It is logical that the report should examine compliance by the different vessel classes already identified. Compliance and regulatory effectiveness are related, and the information would be valuable to this and other Coast Guard regulatory efforts.

The regulation's effect on the environment is another item selected for examination by the report. The law's intended result is the elimination of ship-generated plastics from the waters of the United States, and a reduction in ship-generated garbage. Measurements of amounts of plastic and other garbage in the marine environment seem a necessary part of a compliance report. The effects of the law will be seen by evaluating compliance and environmental effects.

INITIAL PARAMETERS

Constraints

The plan for the required and desired portions of the report filters through a screen of constraints. The first of these is that no additional funds or other resources were allocated by Congress for implementation, enforcement, or for reporting compliance. The compliance report is to be developed using such resources as can be reprogrammed within the Coast Guard. What makes this constraint more difficult to work with is the routine shortage of Coast Guard operating funds. The lack of resources is amplified by any regulatory project's ability to compete within the Coast Guard's needs for operational missions. This is particularly true when those missions include drug interdiction efforts and Maritime Defense Zone planning. Another constraint is the internal human resources available to complete the task. Those responsible for developing the regulation and enforcement plans cannot devote the necessary time to the project without seriously impairing their abiity to perform other necessary functions. A final constraint is the lack of information on the amounts, constituents, and sources of garbage in the waters of the world. Estimates and inferences are all that are currently available.

Needs

The report will need baseline information from which to estimate compliance. Knowledge of the amount of garbage, especially plastic garbage, presently in the ocean is necessary to gauge the effectiveness of the regulatory program. The effects of plastic and other garbage on the environment prior to the regulation will also have to be assessed. Measurements of current compliance and garbage generation by vessel types need to be made or estimated if trends are to be analyzed.

The Coast Guard is interested in assistance in developing the feedback-loop items necessary for placing in perspective the measures of compliance that Congress had identified. Questions concerning data collection needs and possible measures of effectiveness need to be answered. The report's time constraints make additional resource input necessary. In this instance the resource is expertise in evaluative design.

WORK PLAN

Need for Action

The Coast Guard is utilizing an incremental approach for the reporting process because of the short time allotted for the entire regulatory package, including the compliance report. The incremental approach allows general planning for completion of the regulatory project, while permitting changes in detail if new techniques or resources are identified. The method for compilation of the report has not been determined, but the end points for completion, as well as resource parameters for efforts to complete the report, are known. The Coast Guard began by identifying areas in which additional information and expertise were needed. It was decided that these areas should be addressed first. Members of the Transportation System Center (TSC), U.S. Department of Transportation, were retained for this effort.

Initial Studies

The first phase involved the search for existing information and studies. The Coast Guard was especially interested in data on the quality of the environment prior to enactment of the MPPRCA of 1987. However, it was also important to identify sources of empirical data for follow-on studies. Continuing information-gathering efforts or studies would be highly beneficial, as the data gathered would continue through the period in which the Coast Guard was interested.

The information search identified entities actively involved in surveying ocean surface debris and beach litter. Fifty organizations were identified and each was contacted by TSC representatives. Ongoing research efforts were separated and further disaggregated into one-time or continuing efforts. Twelve of the fifty organizations contacted actually had conducted ocean or beach surveys. Five of the twelve that had conducted surveys were doing so on a continuing basis. These five activities appeared to be good sources for data concerning the effects of the new regulations on the environment (U.S. Department of Transportation 1988b).

Information was also needed on the amounts of garbage being generated and preregulation vessel garbage disposal practices. Eastern Research Group had developed much of this information for the Coast Guard during the regulatory development process as part of the regulatory evaluation (U.S. Department of Transportation 1988c). The estimated garbage generation rates for various vessel types are included in Table 1.

Table 1.--Estimated annual quantitites of domestic garbage generated by vessels operating in U.S. waters.

Source	Tons	Percentage of total
Merchant marine	33,574	1.74
Commercial passenger vessels	283,881	14.71
Commercial fishing	256,494	13.29
Recreational boating	1,264,114	65.52
Offshore oil and gas industry	18,381	0.95
Miscellaneous vessels	1,801	0.09
U.S. Navy	63,356	3.28
U.S. Coast Guard	6,782	0.35
U.S. Army	539	0.03
National Oceanic and Atmospheric Administration	349	0.02
Total	1,929,271	100.00

It was apparent, even allowing for errors based on incomplete data, that recreational boating and commercial passenger and fishing vessels create most of the domestic waste (U.S. Department of Transportation 1988a). The garbage disposal practices for different classes of vessels were also estimated and are displayed in Table 2.

It was concluded that recreational boating, commercial fishing, and the U.S. Navy were the leaders in the amount of waste dumped overboard.

METHODOLOGY DEVELOPMENT

Requirements

The most difficult task in planning the report's completion is development of a methodology for measuring compliance with the law and the effects of the new regulations on the coastal and marine environment. Most other portions of the report are straightforward, requiring only data acquisition and formatting. Measuring compliance is another matter. The TSC began with given parameters for developing the methodology. The methodology is to rely on information already being collected by the Coast Guard or other governmental and nongovernmental agencies. The information for measuring compliance should be updated regularly, preferably on an annual basis. In the event that existing data sources and surveys are not adequate to this task, TSC is to recommend ways to acquire the appropriate data. Measurements of the effect of the law on the environment are to use only current data collection and survey efforts.

Table 2.--Estimated amount of vessel-generated domestic garbage disposed of at sea by vessels operating in U.S. waters.

Source	Tons	Percentage of total
Merchant marine	30,493	3.76
Commercial passenger vessels	27,846	3.43
Commercial fishing	256,494	31.63
Recreational boating	421,371	51.96
Offshore oil and gas industry	6,574	0.81
Miscellaneous vessels	1,796	0.22
U.S. Navy	63,356	7.81
U.S. Coast Guard	2,059	0.25
U.S. Army	539	0.07
National Oceanic and Atmospheric Administration	349	0.04
Total	810,877	100.00

Measuring Compliance

Measuring compliance appears to be a fairly simple task. First, find out how many entities are in the regulated population. Then ascertain what portion of the regulated population is obeying the statute. The task is complicated in this instance by the lack of available or collectable data.

The Coast Guard is the primary Federal agency source for information on vessels in the waters of the United States. However, data collection efforts are related directly to legal requirements for maintaining that information. The Coast Guard has a spectrum of information on many types of vessels. Most of the information collected by the Coast Guard is on vessels that are inspected regularly for structural, electrical, safety, and operational requirements. However, Eastern Research Group's estimate is that this population generates less than 20% of the total garbage load entering the waters of the United States. The Coast Guard collects some information on recreational boating, estimated to be the largest garbage contributor. This information is collected through random boardings by Coast Guard regular and reserve personnel and by the Coast Guard Auxiliary. However, less information is collected on recreational vessels than on commercial vessels, and collections are not made on a regular basis. The Coast Guard has virtually no contact with commercial fishing vessels, which are estimated to generate approximately 14% of the total garbage load. Finally, the estimate for the U.S. Navy's contribution to the problem made it the fourth largest contributor. The Coast Guard had no data on or regular contact with the U.S. Navy vessels.

Measurement of the amounts of garbage deposited at ports in the United States before and after implementation of the regulations is likewise hindered by the lack of data. It is apparent that current data collection efforts have to be expanded and other sources of data identified if compliance is to be adequately measured.

Recommended Approach

The study by TSC identified methods by which current data collection shortfalls for measuring compliance with the regulations could be corrected (Department of Transportation 1989). The easiest to address are the data collection efforts associated with commercial vessels currently required to be inspected on a regular basis. Additional data collection would involve requirements associated with the implementation of Annex V. The Coast Guard could also include items associated with Annex V in its examinations of port and terminal facilities.

More information on recreational boating compliance could be obtained by modifying the data collection requirements of the random boarding program to include Annex V requirements. The Coast Guard Auxiliary could also gather information on the level of compliance observed during the courtesy marine examinations that they conduct.

The compliance levels of commercial fishing vessels could be determined by establishing a cooperative effort with the National Marine Fisheries Service (NMFS) for inspecting garbage and fishing net pieces brought in to shore when fishing vessels are off-loading their catches. This would not require an expansion of manpower efforts on NMFS' part.

The compliance level could also be better estimated by conducting in-depth studies of selected ports and vessels on a voluntary basis to observe choices of compliance methods, problems encountered, improvements, and port/vessel interactions.

CURRENT STATUS

The Coast Guard is now processing the recommendations for action. The report is to be developed by a contractor selected through the competitive bidding process. Those entities that are currently conducting studies and surveys are being contacted to ascertain how their information may best be utilized. The Coast Guard is acting internally to effect the changes necessary to collect the additional information needed to measure compliance within the various vessel categories. The NMFS is being approached to ascertain their ability to collect data on fishing vessels returning to off-load their catch. The effort to compile the report has been an interesting exercise in measuring compliance with an environmental regulation that affects a wide range of people. Its success in aiding regulatory efforts will be important, as will the lessons learned in attempting to measure those efforts.

The opinions or assertions contained herein are those of the author and are not to be construed as official or reflecting the opinions of the

Commandant of the Coast Guard, the Chief Counsel of the Coast Guard, or the Coast Guard at large.

REFERENCES

Public Law 100-220.
1987. Title II. The Marine Plastic Pollution Research and Control Act of 1987.

U.S. Congress.
1987. House of Representatives, House Report No. 100-360 to accompany H.R. 940, 100th Congress, 1st Session, 39 p.

U.S. Department of Transportation.
1988a. Development of estimates of garbage disposition in the maritime sectors. U.S. Department of Transportation, U.S. Coast Guard, Transportation Systems Center, submitted by Eastern Research Group, Inc., Cambridge, MA, 139 p.

1988b. Information: CG-849 Annex V compliance measurement subtask 3C.1 results: Search for information on surveys of ocean debris and beach litter. U.S. Department of Transportation, Research and Special Programs Administration memorandum, 10 p.

1988c. Regulatory evaluation on regulations implementing Annex V to MARPOL. U.S. Department of Transportation, U.S. Coast Guard, submitted by Eastern Research Group, Inc., Wash., D.C., 334 p.

1989. Measurement of compliance with MARPOL Annex V regulations. U.S. Department of Transportation, Transportation System Center, Wash., D.C., 34 p.

Whitehead, J. R.
1988. Reducing plastic pollution in the marine environment: The U.S. Coast Guard and implementation of Annex V of MARPOL 73/78. Oceans '88 Conference Proceedings 4:1507-1512.

CONTROL REGULATIONS FOR DISCHARGE OF ONBOARD WASTES FROM SHIPS

Junichi Sawaki*
Office of Marine Pollution Control and Waste Management
Water Quality Bureau, Environment Agency
Chiyoda-ku Tokyo, Japan

and

Ichiro Yamaguchi
Environment Division, Transport Policy Bureau
Ministry of Transport
Chiyoda-ku Tokyo, Japan

*Present address: Patrol vessel *Motobu*, 11th Regional Maritime Safety Headquarters, Maritime Safety Agency, 2-11-11 Minatomachi, Naha-city, Okinawa Prefecture, Japan.

ABSTRACT

In Japan, the disposal into the sea of waste from ships is prohibited in principle, except for its disposal in accordance with discharge standards or under emergency conditions as set forth in the Law Relating to Prevention of Marine Pollution and Maritime Disaster. Especially, the disposal of any form of plastics, including but not limited to synthetic ropes, synthetic fishing nets, cups, and bags, is not permitted. These provisions of the law apply to all ships.

INTRODUCTION

Japan introduced regulations on waste discharge from ships by the Law Relating to the Prevention of Marine Pollution and Maritime Disaster (1970). The law went into effect in 1972, when sea areas of discharge and methods of discharge were specified. It was revised in 1988. Annex V of MARPOL 73/78 went into effect on 31 December 1988.

Wastes generated on board ship are classified in two categories: Wastes from the daily life of crews, and wastes arising from the ordinary operation of ships (e.g., fishing and dredging). Regarding wastes from the crews' daily life, the regulations are equivalent to those of Annex V, and the regulations for wastes generated during ordinary operation are in general more stringent than the annex.

In R. S. Shomura and M. L. Godfrey (editors), Proceedings of the Second International Conference on Marine Debris, 2-7 April 1989, Honolulu, Hawaii. U.S. Dep. Commer., NOAA Tech. Memo. NMFS, NOAA-TM-NMFS-SWFSC-154. 1990.

OUTLINE OF ANNEX V TO MARPOL 73/78

The garbage subject to regulations under Annex V to MARPOL 73/78 is all kinds of victual, domestic, and operational waste, excluding fresh fish and parts thereof, generated during the normal operation of the ship and liable to be disposed of continuously or periodically. Excluded are those substances which are defined or listed in other annexes to the present convention. As to garbage disposal outside special areas, sea areas of discharge and methods of discharge are outlined for each category of garbage in Annex V. Regulations of discharge are the toughest on plastics, including fishing nets, rope, and nylon bags. Their discharge is prohibited in all areas. Dunnage, lining, and packing materials which will float must not be disposed of into the sea <25 nmi from the nearest land. Food wastes and all other garbage must not be discharged <12 nmi from land. However, they can be discharged within 3 to 12 nmi of land if they are <25 mm in size. Any garbage generated on board must not be discharged <3 nmi from land. All ships are subject to the regulations irrespective of their type, size, or usage, even a one-man pleasure boat.

HISTORY OF DOMESTIC REGULATIONS

Japan has the Law Relating to the Prevention of Marine Pollution and Maritime Disaster (hereinafter referred to as "the marine pollution prevention law") (see Appendix A) to preserve the marine environment and protect the life, health, and assets of the people. The marine pollution prevention law in principle prohibits discharge of garbage into the sea unless it is required for emergency evacuation or force majeure and unless certain discharging standards are met. Substances subject to discharge regulations are oil, noxious liquid substances, and other garbage generated on ships, maritime facilities, and aircraft. Japan established the Law Relating to the Prevention of Maritime Pollution by Oil from Ships in 1967 to make 54 OILPOL, including a 1962 amendment, into domestic law. This law was replaced by the marine pollution prevention law in 1970 to include a 1969 amendment to 54 OILPOL, regulate discharging of garbage from ships and of oil and garbage from marine facilities, and implement measures for preventing maritime pollution by oil and other substances. In 1976, obligations to deploy oil-skimming ships, measures for prevention of maritime disaster, and the establishment of a maritime disaster prevention center were added to the law. At the same time, it was renamed the Law Relating to the Prevention of Marine Pollution and Maritime Disaster in order to specify prevention of maritime disaster as well as pollution.

In response to the London Dumping Convention, Japan revised the marine pollution prevention law in 1980 to toughen regulations by establishing controls on waste discharge from aircraft and incineration at sea, and a waste discharge confirmation system. Japan also modified the maritime pollution prevention law in 1983 to subject not only heavy oil but also light oil, noxious liquid substances in bulk, sewage, and other garbage to controls, introduce controls on structures and equipment of ships, and conduct inspection regarding the new controls in order to abide by MARPOL 73/78.

Japan has in this way gradually enhanced regulations for prevention of maritime pollution in response to an international trend and domestic public opinion, and is ready to further toughen and expand such regulations in the future.

CONTROL OF DISCHARGE OF WASTES

Japan's marine pollution prevention law covers both Annex V to MARPOL 73/78 and the London Dumping Convention to regulate discharge of wastes. Annex V regulates garbage generated offshore, while the London Dumping Convention subjects wastes generated on shore to controls. The scope of garbage for Annex V is different from that for the London Dumping Convention, but the marine pollution prevention law unifies regulations under both. It prohibits discharge of wastes from ships in principle, and allows such discharge for emergency evacuation or force majeure and under certain conditions. The marine pollution prevention law defines "wastes" as leavings or rubbish people do not require, excluding oil, noxious liquid substances, and the like. "Discharge" is defined as any action to set afloat or drop matter into the sea. Japan has the same regulations as those under Annex I to MARPOL 73/78 on oil and under Annex II on noxious liquid substances. The marine pollution prevention law thus regulates all wastes other than oil, noxious liquid substances, and the like. It will eventually cover garbage under Annex V to MARPOL 73/78, sewage under Annex IV, and wastes generated on shore under the London Dumping Convention. The law includes waste-discharging standards in accordance with the London Dumping Convention. Hereinafter, we discuss regulations responding to Annex V under the revised marine pollution prevention law put into effect 31 December 1988 and Japan's original controls on discharge of sewage since 1972. Annex IV to MARPOL 73/78, which deals with sewage, has not taken effect, and regulations under this annex have yet to be implemented internationally.

Garbage generated on ships is divided into two categories. One is related to people's daily life and includes trash and sewage. Another covers garbage linked to routine operations of ships. Human life-related trash and sewage are limited in volume and mostly disposable in the sea. Therefore, only on large ships had such garbage been subjected to regulations on discharge. Until Annex IV and V to MARPOL 73/78 take effect, Japan will continue to separate trash from soil in discharging regulations to satisfy the respective annexes. Regulations on human life-related soil have remained unchanged even after Annex V to MARPOL 73/78 went into effect. Japan's regulations on trash were less stringent than those stipulated in the annex, and Japan revised the marine pollution prevention law to introduce regulations conforming to the annex for all ships irrespective of size or type. Under the new regulations, (1) discharge of wastes is prohibited within a distance of <3 nmi from the baseline for territorial waters, (2) discharge of plastics is totally prohibited, but those burned to powder ashes can be dischaged at and beyond a 3-nmi distance from the territorial water baseline, and (3) garbage, whose size must be reduced to <25 mm before discharging under MARPOL 73/78, must be burned to ashes or pulverized by machines meeting certain technical standards before discharge. A type certificate system is established for

the pulverizing machines. These machines are required (1) to reduce the size of any garbage put into them to <25 mm, (2) to perform normal functions despite shaking or vibrations, and (3) to be easy to maintain and clean.

"Ship" is defined under MARPOL 73/78 as a vessel of any type whatsoever operating in the marine environment, and includes hydrofoils, air-cushion vehicles, submersibles, floating craft, and fixed or floating platforms. The ship as defined in the convention thus covers both what is defined as ship and what is defined as maritime facility under the Japanese marine pollution prevention law, so that Japan has subjected both ships and maritime facilities to the same discharging regulations. A ship under the Japanese law is defined as any floating craft used for navigation in the sea. A maritime facility is defined as any structure installed in the sea to house people, treat things, transport things, or stockpile things. It excludes structures which are linked to the shore through fixed facilities for free traffic of people and those connected to the shore for discharging oil or other wastes from the shore. As to garbage generated in relation to routine ship operations, including transportation and fishing, discharging regulations under the Japanese marine pollution prevention law were already tough and almost satisfied requirements under Annex V to MARPOL 73/78. The tough regulations already limited garbage for conditional discharge to what must be disposed of in the sea and prohibited discharging of garbage other than animal waste within 50 nmi of the territorial water baseline. Therefore, Japan made only minor changes in respect to garbage generated as a result of routine ship operations. Regulations on plastics were made as tough as those on human life-related plastic trash, and a distance for prohibiting the discharge of garbage other than animal waste was cut to <12 nmi from the territorial water baseline to conform to Annex V to MARPOL 73/78.

As to garbage generated on maritime facilities in relation to their usual operations, a prohibition against discharging had already been established under the law before the latest revision and has been retained. The garbage discharging standards under the Japanese law were different from those under MARPOL 73/78, and the difference has remained even since Annex V to the convention took effect. But the overall Japanese standards sufficiently fulfill all the requirements under the convention. Furthermore, the Japanese marine pollution prevention law includes independent regulations on discharging of garbage generated on aircraft during flights.

Regulations for discharging garbage generated on ships, maritime facilities, and aircraft under the marine pollution prevention law follow.

CONTROL OF DISCHARGE OF WASTE FROM SHIPS

Daily Life-Related Garbage

Daily life-related garbage is garbage generated in relation to daily life of seamen and other persons on board ships.

Waste Plastics

Sea areas of discharge.--Waters at and beyond 3 nmi from the territorial water baseline.

Method of discharge.--The garbage must be transformed into ashes before discharging. Discharging must be done in small amounts and as far as possible from the coast, and efforts must be made to promptly diffuse the garbage in the water.

Food Wastes

Sea area of discharge.--Waters between 3 and 12 nmi of the territorial water baseline and waters within 500 m of ships or maritime facilities engaged in mining mineral resources at or under the sea bottom beyond 12 nmi from the baseline.

Method of discharge.--The garbage must be transformed into ashes or processed by pulverizing machines meeting certain technical standards before discharging. Discharging must be done in small amounts and as far as possible from the coast, and efforts must be made to promptly diffuse the garbage in the water.

Sea area of discharge.--Waters >12 nmi from the territorial water baseline.

Method of discharge.--Method of discharge is not limited. Discharging must be done in small amounts and as far as possible from the coast, and efforts must be made to promptly diffuse the garbage in the water.

Paper, Wood, and Textile Trash and Other Inflammable Garbage

Sea area of discharge.--Waters between 3 amd 12 nmi from the territorial water baseline.

Method of discharge.--The garbage must be transformed into ashes or processed by pulverizing machines meeting certain technical standards before discharge. Discharging must be done in small amounts and as far as possible from the coast, and efforts must be made to promptly diffuse the garbage in the water.

Sea area of discharge.--Waters >12 nmi from the territorial water baseline.

Method of discharge.--Method of discharge is not limited. Discharge must be done in small amounts and as far as possible from the coast, and efforts must be made to promptly diffuse the garbage in water.

Metal, Glass, and Ceramic Trash and Other Garbage

Sea area of discharge.--Waters between 3 and 12 nmi of the territorial water baseline.

Method of discharge.--Before discharging, the garbage must be processed by pulverizing machines meeting certain technical standards. Discharging must be done in small amounts and as far as possible from the coast, and efforts must be made to promptly diffuse the garbage in the water.

Sea area of discharge.--Waters >12 nmi from the territorial water baseline.

Method of discharge.--Method of discharge is not limited. Discharging must be done in small amounts and as far as possible from the coast, and efforts must be made to promptly diffuse the garbage in the water.

Sewage

Sea area of discharge.--All waters.

Method of discharge.--Discharging is free.

Soil

Sea area of discharge.--Port waters, waters within 10,000 m of a low-water line on the coast, Ise Bay, and the Seto Inland Sea.

Method of discharge.--The garbage must be pulverized before discharge. Discharging must be done under the sea surface, during navigation, in small amounts, and as far as possible from the coast, and efforts must be made to promptly diffuse the garbage in the water.

Sea area of discharge.--Waters other than the above.

Method of discharge.--Method of discharge is not limited. Discharging must be done in small amounts and as far as possible from the coast, and efforts must be made to promptly diffuse the garbage in the water.

Note: Discharging of soil is allowed in all waters for ships whose maximum accommodation capacity slips under 100 persons. It is also allowed in all waters for ships whose accommodation capacity is 100 persons or more if soil is processed by soil treatment machines meeting certain technical standards.

Sea areas of discharge (except for sewage and soil) do not include waters within 500 m of ships or maritime facilities which are engaged in mining mineral resources at or under the sea bottom. Discharging of

garbage is prohibited in such waters with the exception of food trash discharged in waters beyond 12 nmi from the territorial water baseline.

Operation-Related Garbage

Operation-related garbage is garbage generated in relation to transportation, fishing, and other usual operations of ships.

Garbage

Garbage with an ignition loss of 15% or less (an ash state of waste plastics) and inorganic garbage (e.g., ore powder generated on ore carriers).

Sea area of discharge.--Waters >50 nmi from the territorial water baseline.

Method of discharge.--Specific gravity must be raised to 1.2. Garbage must not be discharged in powder form. Efforts must be made to sink the garbage to the sea bottom as promptly as possible. Discharge should be avoided in waters where it is expected to affect growth of marine animals and plants.

> Note: "Ignition loss" indicates how much the mass of a garbage sample (burned garbage) dried at 105°C for 4 h is reduced after the dried sample is heated at 600°C for 2 h. Garbage with an ignition loss of 15% or less has a weight loss of 15% or less. This percentage indicates garbage which has been burned almost completely.

Plant Garbage

Plant garbage consists of wood chips whose sizes have been reduced to 15 cm or less by pulverizing or cutting (e.g., bark generated on timber carriers).

Sea area of discharge.--Waters >50 nmi from the territorial water baseline.

Method of discharge.--Discharging must be done during navigation and in small amounts. Efforts should be made to diffuse the garbage in waters as promptly as possible. Discharging should be avoided in waters where garbage discharge is expected to affect growth of marine animals and plants.

Animal Garbage

Animal garbage (e.g., livestock which died during transport) (excluding fresh fish and parts thereof).

Sea area of discharge.--Waters >12 nmi from the territorial water baseline.

Method of discharge.--Method of discharge is not limited, but discharge should be avoided in waters where it is expected to affect growth of marine animals and plants.

Fish and Other Marine Animals and Their Parts

Sea area of discharge.--Port waters within 10,000 m of a low-water line on the coast, Ise Bay, and the Seto Inland Sea.

Method of discharge.--Method of discharge is not limited, but discharge should be avoided in waters where it is expected to affect growth of marine animals and plants.

Sewage

Sewage--excluding waste water which does not meet the standards in Appendix B (e.g., waste water used for washing cargo holds or the deck). Waste water used for removing garbage on the deck or other places is classified as sewage. Waste water used for removing garbage accumulated on ships is deemed not sewage but the garbage itself.

Sea area of discharge.--All waters.

Method of discharge.--Method of discharge is not limited. Discharge should be avoided in waters where it may affect growth of marine animals and plants.

Notes: Sea areas of discharge for the first three categories of operation-related garbage do not include waters within 500 m of ships or maritime facilities which engage in mining mineral resources at or under the sea bottom. Discharging is prohibited in such waters.

Subject to restrictions set forth in the first three categories of operation-related garbage is garbage generated in relation to ships' usual activities including transportation, fishing, surveying, observation, and rescue operations. If there are two or more categories of garbage meeting different sets of restrictions, the appropriate regulations will be applied.

REGULATIONS ON DISCHARGE FROM MARITIME FACILITIES

Daily Life-Related Garbage

Daily life-related garbage is garbage generated in relation to the daily life of people on marine facilities.

The same regulations as those for control of discharge of waste from ships are applied to maritime facilities, although discharge of sewage and soil is allowed in all waters. Such discharge should be done as gradually as possible. If garbage is discharged in waters within 500 m of facilities

for mining mineral resources beyond a distance of 12 mi from the territorial water baseline, the garbage must be burned to ashes or processed by pulverizing machines meeting certain technical standards. Discharge of food waste is allowed without such processing if discharge is done as gradually as possible.

Operation-Related Garbage

Discharge is prohibited.

CONTROL OF DISCHARGE FROM AIRCRAFT

Daily Life-Related Garbage

Daily life-related garbage is garbage generated in relation to daily life of people on aircraft.

Sewage and Soil

Sea area of discharge.--All waters.

Method of discharge.--Free discharge is allowed.

Garbage Other Than Above

Discharging is prohibited.

Operation-Related Garbage

Discharging is prohibited.

APPENDIX A

REGULATIONS UNDER THE LAW RELATING TO THE PREVENTION OF MARINE POLLUTION AND MARITIME DISASTER: MEASURES FOR PREVENTION OF MARINE POLLUTION AND MARITIME DISASTER

I. Preventive measures.

A. Regulations on pollution.

1. Regulations on discharge at sea.

a. From ships.

b. From maritime facilities and aircraft.

2. Regulations on incineration at sea.

3. Regulations on abandonment of ships.

B. Improvement of garbage treatment on ships.

1. Preparation of manual for the prevention of oil pollution and appointment of oil pollution supervisor.

2. Preparation of manual for the prevention of pollution by noxious liquid substances and appointment of supervisor for prevention of pollution by noxious liquid substances.

3. Preparation and maintenance of oil record book.

4. Preparation and maintenance of noxious liquid substance record book.

C. Regulations on structures and equipment of ships.

1. Structure and equipment standards.

2. Regular checks and receipt of check certificates.

D. Improvement of pollutive substance treatment: The establishment of waste oil disposal facilities and their technical standards.

E. Surveillance, patrol, and instruction.

1. Surveillance and patrol using aircraft and patrol boats.

2. Lectures, instructions.

3. Measures after pollution and disaster.

A. Elimination of pollution.

1. Obligations to report on discharge of oil or noxious liquid substances and vessel-contained noxious liquid substances.

2. Emergency measures.

3. Instructions to eliminate oil, noxious liquid substances, and garbage.

B. Establishment of pollution elimination setup.

1. Preparation of discharged oil elimination plans.

2. Obligations to set up equipment for eliminating discharged oil.

3. Maritime disaster prevention center.

C. Measures for prevention of marine fire.

1. Obligations to report on discharge of dangerous substances and fire.

2. Emergency measures.

3. Allocation of costs.

4. Disposal of assets.

5. Controls on traffic of ships.

D. Technical research and survey.

1. Survey on pollution.

2. Research and development of pollution prevention technology.

E. Penalty and administrative measures.

APPENDIX B

CRITERIA FOR WATER THAT CAN BE DISPOSED OF AT SEA AS OPERATION-RELATED SEWAGE

Cadmium contents	0.1 mg or less/L
Cyanogen contents	1.0 mg or less/L
Organic phosphorus contents	1.0 mg or less/L
Plumbum contents	1.0 mg or less/L
Hexad chromium contents	0.5 mg or less/L
Arsenic contents	0.5 mg or less/L
Total mercury contents	0.005 mg or less/L
Alkyl mercury contents	Not detected
PCB contents	0.003 mg or less/L
Trichloroethylene contents	0.3 mg or less/L
Perchloroethylene contents	0.1 mg or less/L

MARINE PLASTIC DEBRIS: WHAT WASHINGTON STATE HAS DONE

Robert Rose
Washington Department of Natural Resources QW-21
Olympia, Washington 98504, U.S.A.

ABSTRACT

This paper describes the formation of an interagency task force in Washington State to address the problem of marine plastic debris along its coast and in its waterways, and the resulting action plan.

INTRODUCTION

Early in 1987, Commissioner of Public Lands for the State of Washington, Brian Boyle, focused his interest on how marine plastic debris was affecting Washington State's coastal and inland waters. In his role as president of the Western States Land Commissioners' Association, he was familiar with efforts in Texas to increase public awareness about marine plastic debris in that state. As the elected official charged with administering the proprietary interests in more than 2 million acres (810,000 ha) of Washington's submerged lands, the commissioner saw this issue as one of major environmental importance as well as a way to focus attention on the stewardship of the state's aquatic lands.

Recent passage of Federal legislation to prevent dumping plastic into the nation's coastal waters, and a recognition that these persistent materials ultimately pollute aquatic lands, meant that this was an issue with immediate and long-term implications for the health of the state's aquatic lands. Persistent marine debris is a highly visible warning for a wide range of environmental contaminants.

BACKGROUND

Late in 1987, the Analysis and Planning Section of the Washington State Department of Natural Resources (DNR) researched the issue. At that time, levels of awareness varied in Washington State government about marine plastic debris and the Marine Entanglement Research Program. No comprehensive analysis of the issue had been done in Washington State, particularly in light of the recent signing by the United States of MARPOL Annex V and the passage of the Marine Plastic Pollution Research and Control Act of 1987. The interjurisdictional nature of the problem required an interagency cooperation with significant information provided by affected private and public and volunteer groups. Other state agencies and

---

In R. S. Shomura and M. L. Godfrey (editors), Proceedings of the Second International Conference on Marine Debris, 2-7 April 1989, Honolulu, Hawaii. U.S. Dep. Commer., NOAA Tech. Memo. NMFS, NOAA-TM-NMFS-SWFSC-154. 1990.

organizations expressed interest and a willingness to participate with the DNR in reaching a mutually agreed course of action to develop a framework for state policy.

In January 1988, the commissioner held a briefing for key principals from affected Federal, state and local agencies, the legislature, private industry and organizations, and other interested parties. At that briefing, participants agreed to select representatives to serve on a task force that would develop a state action plan to address marine plastic debris in Washington's waters and on its shores.

THE WASHINGTON STATE MARINE PLASTICS DEBRIS TASK FORCE

The commissioner appointed a chairman (Robert Rose) and directed DNR staff to support the effort. Each of the 30 active task force members represented an agency or organization (Fig. 1). A steering committee of six worked closely with the chairman and support staff.

The marine plastics debris task force met monthly from February through July 1988. A detailed agenda was prepared for each meeting, which lasted approximately 7 h. Meetings were advertised and open to the public, with a chance for comments scheduled at the close of each meeting. In the course of the first two meetings, the task force adopted a 6-month work program, and agreed upon its mission, goals and objectives, and policies. The task force divided itself into three working groups: environment, education, and government and economic impact. Each group was to identify issue areas and possible actions.

In following meetings, the groups examined the diverse programs and regulations administered by agencies dealing with marine debris. Each agency or organization representative developed a "Status of Marine Debris Program" sheet and presented this material to the group (Fig. 2). Each status sheet gave the name of the agency or organization, the contact person, importance of the issue, legal authority to deal with the issue, additional authorities needed, resources currently available, and a description of the 1988 action plan (Appendix A). From this information, the staff developed a matrix of the existing authorities of agencies to deal with marine plastic debris (Fig. 3).

The steering committee assembled specific issue areas identified by the task force and developed a number of draft action recommendations which conformed to the objectives and policies. With subsequent approval by the group as a whole, the chairman and steering committee then developed a brief narrative statement explaining the issue area and identifying the agencies responsible for each issue. The recommendations and preferred-lead agencies to carry out the actions were collated and organized by staff and presented to the committee. Over the course of the next two meetings, bolstered by telephone conferences and mailed-in comments, the chair and staff clarified the committee's intent. At the sixth meeting, the task force gave its final approval to the text of the report. With agreement on issue areas, lead agencies, and participating agencies, a detailed matrix was prepared so that agency or organization directors and staff could

ACKNOWLEDGEMENTS

Marine Plastic Debris Task Force

Members

AGENCY / ORGANIZATION	REPRESENTATIVE
FEDERAL	
Department of Commerce National Oceanic and Atmospheric Administration	Alan Buna, LCDR
Department of Interior Fish and Wildlife National Park Service	Don Kane Chuck Janda
Department of Transportation 13th Coast Guard District	Stephen D.Heath, LCDR
Environmental Protection Agency, Region X	Michael Ryiko
STATE	
Department of Community Development	Sandi Benbrook George Turnbull, Jr.
Department of Ecology	Mikel DeBuse Brad Everson Rhonda Hunter Dennis Johnson Pam Miller Leighton Pratt
Department of Fisheries	Sally Hicks Phil Kauzloric Sandra O'Neill
Department of Natural Resources	David G. Bortz Margie Reed Bob Rose, Chairman Glenn Yeary
Department of Wildlife	Steve Jeffries
Office of the Governor	Gerard (Sid) Sidorowicz
Puget Sound Water Quality Authority	Sarah Barton Richard Tucker
State Parks and Recreation Commission	Nina Carter
LEGISLATIVE	
Rep. Nancy Rust, House Environmental Affairs Committee	Ya-Yue J. Van
Joint Select Committee Marine and Ocean Resources	Bob Butts
Senate Environment and Natural Resources Committee	Laurie Schock
LOCAL	
Association of Washington Cities	Andrea Dahl
Northwest Indian Fisheries	B. J. Whitener
Port of Seattle	Linda Cox
Washington Public Ports Association	Eric Johnson Darrell Russell
PRIVATE	
Battelle Marine Research Laboratory	Betsy Brown
Dolco Packaging	Raye Little
Inter Club Boating Association of Washington	Ray Nelson
Marine Digest	Donna Mooney
Natural Resources Consultants	Jeff June
R. W. Beck and Associates	David E.B. Nightingale
Society of Plastics Engineer	Chal B. Rogers
CITIZEN ORGANIZATIONS	
Adopt-A-Beach, c/o Volunteers for Outdoor Washington	Ken Pritchard
The Mountaineers	Margaret Hansen
Washington Citizens for Recycling	Nancy Pearson
Washington Environmental Council	Lisa Macchio
EDUCATIONAL ORGANIZATIONS	
Friday Harbor Laboratories of University of Washington	Dr. Frederick E. Ellis
Poulsbo Marine Science Center	Laurie Dumdle
Seattle Aquarium	John McMahon Cherie Williams
University of Washington/Sea Grant	Xan Augerot Jim Humphreys Patti Mullin

Other Participants

American President Lines, Ltd.

Board of Clallam County Commissioners

Board of Grays Harbor County Commissioners

Board of Jefferson County Commissioners

Board of Pacific County Commissioners

Board of San Juan County Commissioners

Board of Wahkiakum County Commissioners

Marine Resources Company

Northwest Marine Trade Association

Superintendent of Public Instruction

Washington Association of Counties

Project Staff

Department of Natural Resources	John Bergvall Marsha Hixson
Design	Jane Grobins
Editors	Carol Lind Camille Blanchette
Illustrations	Gail S. Weir
Word Processors	Karen Wood Marie Oles Jacque Encarnacion
Photos courtesy of: Center for Environmental Education Cynthia Feutch Chuck Fowler Tom Paul	C.E. O'Clair Groebel Bill High

Special thanks to the Department of Ecology Shorelines and Coastal Zone Management Program for supporting the work of this task force by underwriting the mailing of these documents.

Figure 1.--Marine Plastic Debris Task Force members.

United States Department of the Interior

NATIONAL PARK SERVICE

OLYMPIC NATIONAL PARK

600 East Park Avenue

Port Angeles, Washington 98362-6798

IN REPLY REFER TO:

March 17, 1988

MARINE PLASTICS DEBRIS TASK FORCE

1. Agency: National Park Service (Olympic National Park)

2. Why issue is important: Approximately 60 miles of beaches along the open coast of Olympic National Park have become the repository for uncounted tons of plastic debris. The presence of this material is significant in two respects. Aesthetically, the debris creates an ever-present disfigurement of an otherwise all-natural landscape. The bright colors, the characteristic shapes and the sheer volume of plastics have visually impacted literally every meter of beach in the park. Of equal importance are the known and unknown, physical and chemical effects this debris has on intertidal organisms, including birds and mammals. The impact of introducing this variety and quantity of plastics into a pristine ecosystem cannot be understated.

3. Authority to deal with the issue: The fact that the National Park Service has exclusive jurisdiction within the park is of minor importance since the debris originates outside park boundaries. One legal recourse that, perhaps, deserves attention is the possibility of invoking the Constitution's property clause. While this is a rarely-used authority within the National Park System, the plastics debris issue, in many key ways, meets the criteria for its implementation, not only at Olympic but also in many National Parks along the Pacific Rim, the Gulf of Mexico and the Atlantic seaboard.

No additional authorities would alleviate the current problem and/or improve our enforcement efforts.

4. Resources available: The park has the authority to allocate operating funds and fee collection revenue to beach cleanup and a wide range of research/inventory/monitoring projects. Consistent with other top priorities and shrinking budgets, FTE's can be assigned to in-park and cooperative projects that deal with the plastics issue. The major workload, however, has been and will likely continue to be borne by volunteers.

5. Description of program effort:

(a) Current: The park will continue to operate an annual beach cleanup program. This year's allocation for the project is $4,500. Most of the labor will be provided by volunteer groups.

(b) Planned: Although specific plans have yet to be developed, the park will be initiating projects aimed at increasing visitor awareness and understanding of the issue. These will, for the most part, be integrated with existing interpretive programs such as guided walks, evening programs and wayside exhibits. Some activities may be appropriate in conjunction with State and Federal programs and we would be pleased to participate in any way possible.

(c) Projected: There are no projections for future activities at this time. However, the park is prepared to initiate or participate in efforts as opportunities arise and/or funds permit.

(d) Cooperative effort: Aside form our interest in continuing to work with the Task Force and State and Federal programs that will eventually be implemented, the park has only one identifiable cooperative program as a possibility. The National Marine Fisheries Service is interested in Olympic as one of four nationwide sites to be surveyed for marine debris accumulation. As stated in the study proposal, the objective would be:

> "To develop a program of systematic surveys in each region of the coastal United States to assess the types, quantities and sources of debris arriving on these shores, and to identify trends or changes in these parameters."

Final site selection is expected within the next few weeks.

Figure 2.--Sample agency status sheet.

EXISTING AUTHORITIES AND AGENCIES DEALING WITH MPD

	PROGRAM		ENFORCEMENT			
AGENCY	DEVELOPED	POTENTIAL	DEVELOPED	POTENTIAL	STATUTES	FUNDING
EPA, REGION X	▮ National ongoing plastics pollution study ▮ 1986-87 Adopt-A-Beach program with Seattle Aquarium; volunteer project hndbk. completed ▮ State of the Sound exhibit with Seattle Aquarium	▮ Public Education in cooperation with NOAA and Dept. of Transportation ▮ Support establishment of baseline data and monitoring program ▮ Additional technical support			▮ Marine Plastics Pollution, Research and Control Act (MPPRCA) (PL 100-220) ▮ Clean Water Act, Section 108	
USFWS	▮ Beach cleanup	▮ Cooperative actions ▮ Field monitoring ▮ Public education materials			▮ Fish and Wildlife Coordination Act ▮ Endangered Species Act ▮ Migratory Bird Treaty Act ▮ Anadromous Fish Conservation Act ▮ Rivers and Harbors Act of 1899 ▮ Clean Water Act	
NPS	▮ Beach cleanup	▮ Research and monitoring; Olympic Nat'l Park as an accum. monitoring site ▮ Cooperative action ▮ Visitor information/education	▮ Exclusive jurisdiction in national parks ▮ Authority to prosecute	▮ Increased enforcement	▮ Title 16, 18 U.S. Code	
NMFS	▮ Marine entanglement research program		▮ Enforcement personnel available		▮ National Marine Mammal Protection and Control Act	
COAST GUARD		▮ Participation with EPA and NOAA on public education	▮ Fines for vessels ▮ Certification of port facilities ▮ Developing regulations	▮ Increased enforcement (with increased funds)	▮ MPPRCA	

Figure 3.--Sample taken from table of existing authorities and agencies.

quickly reference their responsibilities and relationships with other agencies (Fig. 4).

The task force recognized that marine plastic affects fisheries and wildlife resources, endangers boaters and divers, and diminishes aesthetic enjoyment of the state's shorelines. Increasing public awareness and interest about the specific issue of marine plastic debris is a key element of the plan, with a strong emphasis on education. The task force recommendations emphasize recycling and proper disposal of potential marine plastic debris materials. In addition, the coordination of present and future cleanup efforts is critical to use Federal, state, local, and citizen resources efficiently.

The task force wanted its recommendations to be thoroughly examined by the affected agencies and incorporated into future work plans and budgets. Because the issue involves so many agencies and organizations and will involve a commitment of resources over time, the task force recommended designation of an overall coordinating agency.

MARINE PLASTIC DEBRIS: ACTION PLAN

The action plan was completed in October 1988 and presented to the commissioner, the public, and media at a press conference on the Seattle waterfront. The publication of the document was timed to coincide with the last day of Washington State's Coastweeks '88. The Adopt-A-Beach Program, sponsors of Coastweeks (under the auspices of the Washington Department of Ecology), organized the event and collected a representative sampling of debris from the riprapped shore of Elliott Bay.

The 1988 plan is organized into four sections.

Part 1 of the action plan explains how the Marine Plastic Debris Task Force developed a plan to address a major environmental problem: debris in Washington waterways. The floating garbage was not only unsightly but dangerous. How the task force focused on issues and their recommended actions are discussed.

Part 2 of the action plan presents the mission statement for the Marine Plastic Debris Task Force and the goal and objectives for the plan. Policies to guide and coordinate future activities are followed by 20 action recommendations designed to implement the policy statements. These recommendations are divided into three sections: environment, education, and government/economic impact. Part 2 also lists seven required legislative or administrative initiatives. (The mission statement, goal and objectives, and policies of the Marine Plastic Debris Task Force (1988), as documented in the Marine Plastic Debris Action Plan, are found in Appendix A of this paper. A summary of the marine debris action recommendations and the required legislative or administrative initiatives are found in Appendix B of this paper.)

Part 3 of the action plan contains the full text for each of the action recommendations including a short narrative explaining the

ACTION RECOMMENDATIONS AND THE LEAD AGENCIES INVOLVED

ENVIRONMENT

ACTION RECOMMENDATIONS / ORGANIZATIONS	1 Designate coordinating and clearinghouse agency	2 Develop environmental baseline and monitoring system	3 Coordinate beach cleanups	4 Conduct research on wildlife and fisheries effects	5 Coordinate ghost net removals	6 When feasible, require and promote recycling and alternative products	7 Recycling and disposal	8 Convene biennial statewide conference	9 Develop and implement a public outreach program
Coordinating agency		L						L	L
NOAA/NMFS	P	P		P	P	P	P		P
USFWS	P	P	P	P					P
NPS	P	P	P						P
CG	P	P					P		P
EPA	P	P		P		P	P		P
DOL	P								P
DCD	P								P
DOE	L	P	L			L	L		P
WDF	P	P	P	L	L	P			P
DNR	L	P	P		L	P			P
WDW	P	P	P	L	P				P
OFM									P
Office of Governor	P								P
DOR									P
PSWQA	P								P
State Bd. of Pilotage	P								P
Parks	L	P				P	L		P
SPI	P								P
IAC	P						L		P
Hse Env. Affrs. Com.	P								P
House Energy & Nat. Res. Coms.									P
Joint Select Com. Mar. & Ocean Res.	P								P
Senate Environ. & Nat'l Res. Com.	P								P
State Legislature	P						L		P
Association of Washington Cities		P	P		P	P	P		P
Wa. Assoc. of Counties		P	P		P	P	P		P
Port of Seattle		P	P				P		P
Wa. Pub. Ports Assoc.		P	P		P		P		P
County Auditors									P
Colleges & Universities	P	P	P						P
Private Companies	P	P	P	P		P	P		P
Aquariums		P		P					P
Marine Labs		P		P					P
Adopt-A-Beach		P	P						P
Indian Tribes		P							P
Dive Groups/Shops					P				P
Environ. Groups									P
Citizen Recycling Org.							P		P

L - Lead agency P - Participating agency

Figure 4.--Sample taken from Table 4 of action recommendations.

background of the issue. For each action recommendation, a lead agency is designated as well as a listing of agencies likely to participate in carrying out the action. A suggested time frame for implementation and an estimate of the duration of the action are proposed for each of the 20 action recommendations.

Part 4 of the action plan consists of three appendixes. Appendix A of the plan is a compilation of reports outlining the status (as of September 1988) of agency and organization activities, authorities, and current and proposed programs. Appendix B of the plan contains an overview and explanation of the Marine Plastic Pollution Research and Control Act of 1987. Appendix C of the plan encapsulates various Washington State programs addressing the problem of marine debris.

Copies of the action plan are available from Photo and Map Sales, Department of Natural Resources, 1055 Capitol Way S, AW-11, Olympia, WA 98504, (206) 753-5338.

IMPLEMENTATION

Since presenting the task force report to Commissioner Boyle, a number of steps have been taken to make the action plan a reality.

Designees of the directors of Parks, Ecology, and Natural Resources met in early 1989 to decide which agency should take the lead for coordinating future state marine plastic debris activity. As a result of that meeting, the Department of Natural Resources, having initiated and staffed the planning effort, was designated lead agency. The relationship among the agencies was formalized in a memorandum of understanding. Based on this agreement, the department prepared legislation for the 1989 Legislature. House Bill 1249 was to authorize the DNR to coordinate implementation of the action plan and to develop rules for cleanup and prevention of pollution in state waters. The department is also authorized to enter into intergovernmental agreements with Federal, state, or private parties, and to hire employees necessary to coordinate the plan.

An important conclusion of the task force deliberations was the recognition that a coordinator was necessary to assure that agencies followed through on the tasks contained in the action plan. This legislation provides the authority and funding source to make the plan a success.

At the same time, the Department of Ecology has funded through the coastal zone management program a baseline inventory survey of selective beaches. This will be carried out by the Adopt-A-Beach program using a newly revised inventory form. Beginning on 25 March, a scientific inventory of selected beaches will occur biweekly for a year, thus providing the first baseline information on marine plastic debris occurrence on Washington's shores.

As a result of widespread publicity about the report, the 1989 and 1990 Department of Transportation's Tide Tables, a popular and necessary document requested by boaters and fishermen along the Washington coast,

contains a special eight-page insert about proper disposal of all marine debris and sewage, with a special emphasis on plastic and other nonbiodegradable materials.

A ghost net task force with representatives from State Departments of Fisheries, Wildlife, and Natural Resources, interested citizens and divers, and the National Marine Fisheries Service, NOAA, is developing an interagency memorandum of understanding and protocols for ghost net and crab pot removal.

The Department of Natural Resources will start publishing a marine plastic debris newsletter to bring current activities and opportunities to the attention of boaters, lessees, citizen groups, and others interested in maintaining and improving Washington's aquatic environment.

CONCLUSION

The development and publication of the "Marine Plastic Debris Action Plan for Washington State" was the first and necessary step for addressing the presence and consequences of persistent debris in the state's waters and on its shores. As a result of the plan, institutional arrangements have developed which would not have been possible without the framework proposed by the task force. Positive response by the Washington Legislature portends support for the Department of Natural Resources to develop the necessary educational materials, to create public and private partnerships, and to raise the importance of this issue in the public mind.

REFERENCES

Marine Plastic Debris Task Force.
1988. Marine plastic debris action plan for Washington State. Marine Plastic Debris Task Force, Washington State Department of Natural Resources, 2d ed., December 1988, var. pag.

Appendix A.--The mission statement, goal and objectives, and policies of the Marine Plastic Debris Task Force (1988).

MISSION STATEMENT

The purpose of the task force is to increase public awareness and interest about marine plastic debris and to develop a framework for coordinating public and private efforts to ensure an effective response. Plastic debris in the aquatic environment has an adverse impact on wildlife, aesthetics, navigation and overall environmental quality. The task force recognizes that this material is part of a larger problem of waste generation and management. The Washington State plan will link private, local, state and federal efforts in managing the plastic waste stream as it affects the shorelines and aquatic environment.

GOAL AND OBJECTIVES

Goal

To develop a state action plan to address the marine plastic debris issue that affects Washington's shorelines and aquatic environment.

Objectives

1. Identify plastic debris in the aquatic environment as a distinct issue.

2. Develop and support mechanisms to reduce or eliminate marine plastic debris.

3. Focus primarily on marine resources affected by plastic debris, with attention to impacts on other aquatic environments in the state.

4. Provide input to and develop steps for emerging private, local, state and federal policies and actions.

5. Develop and implement mechanisms that will coordinate actions performed by agencies and organizations.

6. Encourage and support private and public policy to increase awareness through education efforts in Washington State.

POLICIES

The Marine Plastic Debris Task Force recommends that the state of Washington, acting through its elected officials, and in cooperation with other appropriate agencies, offices, organizations and the private sector, should seek to:

1. Increase public awareness about effects of marine plastic debris.

2. Designate a lead agency to act as a clearinghouse and coordinator for marine plastic debris activities in Washington.

3. Designate appropriate agencies to draft, review and support legislation and/or regulations recommended by the task force.

4. Empower responsible agencies to implement and participate to the fullest extent in actions recommended by the task force and other actions judged necessary.

5. Encourage funding measures on all levels to facilitate compliance with MARPOL requirements and to implement task force recommendations.

6. Coordinate, support and encourage continued volunteer efforts and special events related to the marine plastic debris issue.

7. Encourage and support efforts by all the state's users of the marine environment to reduce and eliminate marine plastic debris.

8. Support and encourage the plastics industry and other industries to continue research and development of products which are adaptable to recycling and proper disposal.

9. Maintain and expand baseline data collection and research on sources, quantities, effects and fates of marine plastic debris.

10. Encourage ports and local governments to collect and dispose of marine plastic debris in an environmentally sound manner.

11. Support regional, national and international efforts to reduce and eliminate marine plastic debris.

Appendix B.--Summary of the marine debris action recommendations and the required legislative or administrative initiatives (Marine Plastic Debris Task Force (1988)).

SUMMARY OF ACTION RECOMMENDATIONS

(1) ACTION RECOMMENDATION: Designate an agency or entity to coordinate activities and serve as a clearinghouse for marine plastic debris data reception and information dissemination.

ENVIRONMENT

(2) ACTION RECOMMENDATION: Develop an environmental baseline and monitoring system for marine plastic debris in Washington.

(3) ACTION RECOMMENDATION: Coordinate beach cleanup efforts among various agencies.

(4) ACTION RECOMMENDATION: Conduct additional research about the effects of plastic debris on wildlife and fisheries resources and habitat.

(5) ACTION RECOMMENDATION: Coordinate information about and and removal of ghost nets and other derelict equipment from state waters among DNR, Department of Fisheries, NOAA, and local agencies.

(6) ACTION RECOMMENDATION: Require and promote recyclable or alternative products when feasible for use in or near the marine environment.

(7) ACTION RECOMMENDATION: Require recycling and proper disposal of potential marine plastic debris materials for federal, state and local agencies and Indian tribes.

EDUCATION

(8) ACTION RECOMMENDATION: Convene a biennial statewide conference by the designated marine plastic debris coordinating agency.

(9) ACTION RECOMMENDATION: Develop and implement a public outreach program using the recommended logo [Illustration 6], public service announcements, publications and special events.

(10) ACTION RECOMMENDATION: Develop and distribute media materials directed at domestic and foreign maritime communities.

(11) ACTION RECOMMENDATION: Develop a marine debris curriculum for use at state and private maritime schools training the professional maritime community.

(12) ACTION RECOMMENDATION: Post permanent information signs about why MPD and other litter is harmful to water quality, wildlife and fish as well as a threat to boating safety at all boat launch ramps, public access sites and public and private marinas.

(13) ACTION RECOMMENDATION: Require that all state-licensed and registered users of Washington waters receive MPD information materials and display a plaque or decal about proper disposal of MPD and other litter.

(14) ACTION RECOMMENDATION: Encourage retail and manufacturer cooperation to aid in marine plastic debris public education.

(15) ACTION RECOMMENDATION: Incorporate the MPD problem into the environmental section of the state's required curriculums for grades K-12 and in other educational material.

GOVERNMENT/ECONOMIC IMPACT

(16) ACTION RECOMMENDATION: Incorporate an analysis of the true costs of marine debris, including fiscal impacts and nonquantifiable environmental costs into policy decisions.

(17) ACTION RECOMMENDATION: Conduct an independent cost/benefit analysis of MPD compliance and cleanup.

(18) ACTION RECOMMENDATION: Integrate MPD disposal with comprehensive solid waste planning.

(19) ACTION RECOMMENDATION: Increase public awareness about the legal consequences for improper MPD disposal.

(20) ACTION RECOMMENDATION: Develop a framework of financial incentives to encourage proper disposal of MPD.

REQUIRED LEGISLATIVE OR ADMINISTRATIVE INITIATIVES

1. Marine Debris decal--Departments of Fisheries and Licensing should require that all Washington-licensed boats have a prominently displayed decal regarding proper disposal of marine plastic debris and other wastes.

2. Information for boaters--Require the Department of Licensing include an information packet containing legal requirements for marine plastic debris disposal when issuing boat registrations or renewals.

3. Legislation--Support passage of the State Parks legislation for Boater Recreation Fee Account funds to be used for boater environmental education and to provide capital for sewage pump-out facilities and educational signs.

4. Agreement--Formal agreement among DNR, Department of Fisheries, NOAA (and other appropriate agencies) is necessary to assume prompt location and removal of ghost nets.

5. Funding--Investigate Ecology's Litter Tax program (Chapter 70.93 RCW) for the possibility of directing funding from that program to the marine debris cleanup issue.

6. Clearinghouse--Develop an appropriate memorandum of understanding for the coordinating agency.

7. Staffing--Consider increased state enforcement through WDOE, WDF personnel to carry out these recommendations.

THE PROTECTION OF SPECIFIC SEA AREAS AGAINST MARINE DEBRIS

Gerard Peet
Heemraadssingel 193
NL 3023 CB Rotterdam
The Netherlands

(This paper was presented in April 1989. It has since been updated (e.g., a new title, amended criteria) to include developments occurring at the Marine Environment Protection Committee meeting of March 1990.)

ABSTRACT

The problems associated with debris in the marine environment are being given increased attention. At the international level this attention is reflected in a number of international agreements. Most of the relevant international regulations aim at reduction of debris-associated pollution at the source. In addition to policies aimed at source control, efforts are also made to develop protective measures for specific sea areas. This paper discusses efforts currently under way within the framework of the International Maritime Organization.

In the mid-1980's, the International Maritime Organization decided to develop guidelines for the designation of "special areas" and the identification of "particularly sensitive areas." These guidelines should assist national authorities in developing measures to provide specific areas with additional protection from environmental damage caused by shipping activities. The Baltic Sea became a special area as of 1 October 1989. The United States has announced a proposal to designate the Gulf of Mexico as an Annex V special area as well. The Governments of the North Sea States have formally proposed to do the same for the North Sea. Another major option to protect specific sea areas is the designation "area to be avoided by ships." The Northwestern Hawaiian Islands are an example of such an area.

INTRODUCTION

Several years ago, a photograph of a dead albatross spread out on a beach together with a systematic display of the plastics found in the bird's stomach brought home to me the point that there was more to pollution of the seas than oil or chemicals. Photographs like this one of

---

In R. S. Shomura and M. L. Godfrey (editors), Proceedings of the Second International Conference on Marine Debris, 2-7 April 1989, Honolulu, Hawaii. U.S. Dep. Commer., NOAA Tech. Memo. NMFS, NOAA-TM-NMFS-SWFSC-154. 1990.

birds and sea mammals entangled in or killed by plastics and other persistent materials have helped to increase attention for the problems associated with debris in the marine environment worldwide.

My first real encounter with debris-associated pollution was on board a Greek passenger ferry in the Mediterranean. Passengers freely threw plastic bags and other garbage overboard. It emphasized the importance of shipping as a source of this type of pollution.

My second important encounter with debris-associated pollution involved an invitation by an artisanal fisherman in one of the Southeast Asian countries to come and see how plastics rather than fish filled his nets. He took me to the source of these plastics. The waste dump of the town he lived in was located on a waterfront. One of the ironies of this was that waste from this dump would not only fill the fisherman's nets, but would also wash up at the town's beaches. These beaches were cleaned regularly, and the collected waste brought to this waste dump. It reminded me that there were more sources of debris-associated pollution than ships.

Increased attention to the problem has now led to increased attention to measures to control pollution from land-based sources as well as from ships on both national and international levels. This paper concentrates on international measures.

SOURCES OF DEBRIS-ASSOCIATED POLLUTION AND INTERNATIONAL AGREEMENTS FOR POLLUTION CONTROL

Land-Based Pollution

Although the international dimension of debris-associated land-based pollution appears to be limited, there are some important international agreements in this respect. The Convention for the Protection of the Mediterranean Sea Against Pollution and its related protocols (1976) is one of these. "Persistent synthetic materials which may float, sink or remain in suspension and which may interfere with any legitimate use of the sea" are on the Annex I list of the Protocol for the Protection of the Mediterranean Sea Against Pollution from Land-Based Sources (1980); "substances which, though of a non-toxic nature, may become harmful to the marine environment or may interfere with any legitimate use of the sea owing to the quantities in which they are discharged" are on the Annex II list of this protocol. Pollution by Annex I substances should be eliminated (Art. 5 of the protocol); pollution by Annex II substances should be strictly limited (Art. 6 of the protocol). Similar regulations have been included in other international agreements regarding land-based pollution such as the Convention for the Protection of the Marine Environment and Coastal Area of the Southeast Pacific and its Supplementary Agreements (1981, 1983), and the Paris Convention for the Prevention of Marine Pollution from Land-Based Sources (Northwestern Europe 1974).

If effectively implemented, these regulations should provide a basis for sufficient control of debris-associated land-based pollution in the areas where these regulations apply.

Dumping of Wastes at Sea

Another source of debris-associated pollution is the dumping of wastes at sea. On a global as well as on a regional level, international agreements have been developed to regulate the dumping of wastes at sea. The global Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (the so-called London Dumping Convention of 1972) has addressed the dumping of plastics and other types of debris by putting "persistent plastics and other persistent synthetic materials, for example, netting and ropes, which may float or remain in suspension in the sea in such a manner as to interfere materially with fishing, navigation or other legitimate uses of the sea" on its Annex I. The dumping of Annex I substances at sea is prohibited (Art. IV.1.a). "Containers, scrap metals or other bulky wastes liable to sink to the sea bottom which may represent a serious obstacle to fishing or navigation" and "substances which, though of a nontoxic nature, may become harmful due to the quantities in which they are dumped, or which are liable to seriously reduce amenities" were put on Annex II, thus requiring a prior special permit if dumping is to take place (Art. IV.1.b).

Guidelines have been developed for the identification of discharge or dump sites. These guidelines include consideration of such factors as the capacity of the receiving marine environment to receive wastes without undesirable effects and the ecological condition of the area.

Effective implementation of the London Dumping Convention (which, in early 1989, had been ratified by 63 states) could be the basis for controlling this source of pollution.

Operational Pollution From Ships

Research into the origin of plastics and other marine debris suggests that a substantial part of these substances originates from ships at sea (e.g., Dixon and Dixon 1981). A recent report about the German Bight (Schrey 1987) estimates that 95% of the refuse found on beaches of the German Bight can be attributed to shipping.

Any effort to control this source of debris-associated pollution from ships must have an international dimension since most of the world's seas and oceans are international waters. Ships traveling these waters are flying the flags of many nations. International regulations affecting these ships are developed by the International Maritime Organization (IMO), a United Nations agency which as of April 1989 had 133 member states and which consequently is well placed to effectively develop such international regulations.

Operational pollution from ships has been regulated by the IMO in the International Convention for the Prevention of Pollution from Ships (the so-called MARPOL Convention of 1973/78). This convention is now under constant review by IMO's Marine Environment Protection Committee (MEPC). The MARPOL Convention includes regulations to control operational pollution from ships with oil (Annex I), noxious liquid substances in bulk (Annex

II), harmful substances in packaged forms (Annex III), sewage (Annex IV), and garbage (Annex V). Marine debris falls within the scope of Annex V of the MARPOL Convention.

It is important to properly appreciate the MARPOL Convention. This convention was concluded in 1973 and, at that time, already included very strict rules with regard to the disposal of plastics at sea. Yet, its Annex V, the plastic and garbage regulations, did not enter into force until more than 15 years later, on 31 December 1988.

THE EFFECTIVENESS OF EXISTING INTERNATIONAL MEASURES WITH RESPECT TO MARINE DEBRIS

International regulations for control at the source of the introduction of marine debris into the marine environment do exist. The important question, however, is whether they are effective.

As regards land-based pollution, there is only one global international instrument, the so-called Montreal Guidelines. Their effectiveness is limited because they are not binding. Most of the regional international regulations are no more than one or two general articles in a general convention on environmental protection. There are only a few exceptions where special protocols or specific conventions with regard to land-based pollution were developed. The effectiveness of the existing regulations is limited because there is no worldwide coverage of international regulations; many regions do not have such regulations.

There is some doubt about the effectiveness of regional international regulations where these have been developed up to a level of specialized protocols or even specific conventions. One example may illustrate this. With respect to synthetic materials (a blacklisted substance in the Paris Convention), no action at all appears to have been taken by the Commission of the Paris Convention in the first 10 years of its existence (Oslo and Paris Commission 1984; Paris Commission 1987).

As for the dumping of wastes, the London Dumping Convention seems to be an effective instrument. Nevertheless, in at least one instance the convention failed for lack of enforcement.

In April 1988, the car-carrier *Reijin*, with more than 5,000 new cars on board, capsized close to the Portuguese coast. After considering the various salvage options, it was decided to dump two-thirds of the cars from the ship into water 2,000 m deep. The wreckage of the ship together with the remaining cars were then to be sunk in deep water as well (MEPC 1989a). In effect this would mean the dumping at sea of a number of substances from Annex I of the London Dumping Convention for which dumping at sea is prohibited. Plastics and other persistent materials used in the cars were among these Annex I substances. During the 1988 Consultative Meeting of Contracting Parties to the London Dumping Convention, the delegation of Denmark as well as observers from the environmental organizations Greenpeace and Friends of the Earth International raised the issue as being at odds with the regulations and spirit of the London Dumping Convention. The

consultative meeting took no action (pers. observ.). Dumping of cars at sea did start but was stopped after a time.

Finally, with respect to operational discharges by ships, not enough time has elapsed since the entry into force of Annex V of the MARPOL Convention to judge its effectiveness. Doubts have been raised, however, in this regard. Many consider control and enforcement of the provisions of the annex to be extremely difficult. Guidelines for its implementation were completed by MEPC in September 1988 (MEPC 1988f), less than 4 months before its entry into force. It is doubtful whether the necessary reception facilities are available in all ports.

THE PROTECTION OF SENSITIVE SEA AREAS AGAINST DAMAGE BY SHIPPING ACTIVITIES: BACKGROUND

Considering the problems encountered in controlling the discharge of marine debris at the source, one wonders whether a complementary approach of giving special protection to specific sensitive areas might be useful. Within the IMO, efforts are now under way to assess the opportunities such an approach might offer with respect to marine pollution caused by ships.

The IMO has several options for providing additional environmental protection to specific sensitive sea areas. These include the designation of areas as "special areas" under the MARPOL Convention, the designation of areas as "areas to be avoided," or the use of other ship's routing measures such as traffic separation schemes and deep-water routes. With respect to debris-associated pollution, the first two options are especially relevant.

Special areas will normally be larger sea areas. To provide some protection for sea areas which would not qualify as special areas, the International Conference on Tanker Safety and Pollution Prevention in 1978 adopted a resolution which invited the IMO:

> "to initiate. . .studies, in collaboration with other relevant international organizations and expert bodies, with a view to making an inventory of sea areas. . .which are in special need of protection against marine pollution from ships and dumping. . .; assessing. . . the extent of the need of protection, as well as the measures which might be appropriate. . .; to consider. . .what action will be needed. . .; to take action. . .within the framework of the relevant conventions. . . ."

In 1985, the IMO started to work on this issue of particularly sensitive sea areas and put it on the agenda of the twenty-third session of the MEPC, which was to take place in 1986. Discussion of the issue at this meeting (MEPC 1986) resulted in the decision to send out a circular letter to IMO member states inviting these states to provide information on the following:

- Criteria which have been used in designating existing marine areas under national jurisdiction which are particularly sensitive with respect to their renewable natural resources

or their importance for scientific purposes, and for which special protection measures are in force.

- National protection measures and restrictions affecting the use of such areas by ships and related maritime activities, and the specific purpose of the restrictions imposed.

- The geographical location of those marine areas which are already protected and of those areas considered for future protection, the seaward limits of which extend beyond the territorial seas established in accordance with international law.

On the basis of the responses to this circular letter, the MEPC developed criteria for the designation of particularly sensitive sea areas and also started work on developing criteria for the designation of special areas. At the twenth-sixth session of MEPC, a proposal was put before the MEPC on how to proceed and how to make the concept of particularly sensitive sea areas operational (MEPC 1988d).

The proposal did not aim at developing new legal instruments, but at making better use of existing international regulations (such as the designation of special areas) for the protection of specific sea areas against damage caused by shipping activities. The MEPC adopted this proposal (MEPC 1988f) and decided to develop a manual for the designation of particularly sensitive sea areas and special areas. Since the adoption of this proposal some changes have been made to the concept of the manual, including its title, which now is "Guidelines for the designation of special areas and the identification of particularly sensitive areas" (MEPC 1990). The basic concept of providing guidance for better use of existing international regulations is still the same.

GUIDELINES FOR THE DESIGNATION OF SPECIAL AREAS AND THE IDENTIFICATION OF PARTICULARLY SENSITIVE AREAS

The main objective of the guidelines is to provide governments or government departments having limited experience in developing proposals to the IMO with detailed guidance on how to prepare such proposals for environmental protection of specific sea areas. It will also set standards which proposals for the designation of special areas will have to meet if they are to be accepted.

The guidelines will present a range of existing international regulations which could be used better or more frequently for environmental protection purposes. They will be restricted to damage from ships in or in the direct vicinity of an area, and will not address land-based pollution or the dumping of wastes at sea.

They will consist of three parts: (1) a general introduction, (2) criteria and procedures for the designation of special areas as well as some examples of special areas already designated, and (3) criteria for the identification of particularly sensitive areas, criteria and procedures to

provide such areas with additional protection in accordance with IMO regulations, and some examples of areas which have already been given such additional protection.

Guidelines: General Introduction

This first chapter of the guidelines will review their history and background as well as the role the IMO can play in the protection of sensitive sea areas. Attention will also be given to the types of damage ships can cause to sensitive sea areas. One of these will be the discharge of marine debris, including plastics.

The list will, however, not be limited to discharges of the "traditional" substances such as oil or chemicals; it will also include the discharge of ballast water contaminated with "alien" organisms (which has already caused problems near Tasmania, Australia, and in the Great Lakes, Canada, and the United States), the "discharge" of TBT paints from the hull of ships into the marine environment, and even the "discharge" of noise.

Neither will it be limited to damage caused by discharges; physical damage to marine ecosystems (such as the damage to coral reefs caused by the grounding of the *Wellwood* off Key Largo, Florida, United States, in 1984) will also be discussed.

Guidelines: Special Areas

The second chapter of the guidelines will address the designation of special areas. Annex V of the MARPOL Convention defines a special area as "a sea area where for recognized technical reasons in relation to its oceanographic and ecological condition and to the particular character of its traffic the adoption of special mandatory methods for the prevention of sea pollution by garbage is required" (Annex V, Reg. 1.3). The disposal of all plastics, including but not limited to synthetic ropes, synthetic fishing nets, and plastic garbage bags, and of all other garbage, including paper products, rags, glass, metal, bottles, crockery, dunnage, lining, and packing materials is prohibited in special areas. Food wastes can only be disposed of as far as practicable from land but in any case not less than 12 nmi from the nearest land (Annex V, Reg. 5.2).

A word of caution is appropriate with respect to the potential merits of the stricter discharge regime of an Annex V special area: The disposal into the sea of all plastics is prohibited everywhere in the world's seas and oceans. The designation of an area as an Annex V special area will not give any additional protection against plastics pollution beyond that. The merit in this respect would be the increased pressure in such areas to provide the necessary port reception facilities for plastics and other garbage. The disposal into the sea of other types of garbage (e.g., dunnage, lining) would be further limited by a designation as an Annex V special area provided the area is large enough to include areas which are more than, respectively, 25 or 12 nmi from the nearest land. If not, discharge regulations similar to those for a special area will apply anyway within 25 nmi from the nearest land for dunnage, lining, and packing

materials which will float, and within 12 nmi from the nearest land for food wastes and all other garbage.

Five sea areas (the Mediterranean Sea, the Baltic Sea, the Black Sea, the Red Sea, and the "Gulfs Area" (Annex V, Reg. 5.1)) have each been designated as Annex V special areas, but this designation is effective only for the Baltic Sea. For the other sea areas, the special area status will enter into force as soon as there are sufficient reception facilities for garbage in the area (Annex V, Reg. 5.4). In October 1989, the decision was made to designate the North Sea as an Annex V special area. A proposal to designate the Gulf of Mexico as an Annex V special area has been discussed by MEPC but no decision to do so has been made.

Criteria for the designation of special areas were developed during MEPC's twenty-sixth session (MEPC 1988a) and were amended in March 1990 during MEPC's twenty-ninth session (MEPC 1990). They include oceanographic conditions (e.g., particular circulation patterns, long residence times, extreme ice states or adverse ice conditions), ecological conditions (e.g., depleted, endangered, or threatened species; areas of high natural productivity; spawning, breeding, and nursery areas; rare or fragile ecosystems or critical habitats), and vessel traffic characteristics. A special area should also be an area of such a size that, were it not a special area, discharges of garbage could be made in the area in accordance with the discharge criteria of Annex V established for open sea areas.

It was also noted that consideration should be given to the extent to which the condition of a sea area is influenced by nonmaritime sources of pollution. Proposals for the designation of a special area will be strengthened by information on measures that are being or will be taken to prevent, reduce, and control pollution of the marine environment by these other sources of pollution.

The Baltic Sea: The First Annex V Special Area

To date, the Baltic Sea is the only Annex V special area to enter into force. At the twenty-sixth session of the MEPC, the Governments of the Baltic Sea States submitted notification to the IMO that adequate reception facilities had been provided in all ports within the Baltic Sea Area (MEPC 1988e). The MEPC then unanimously decided that the Annex V special area status for the Baltic Sea would take effect on 1 October 1989 (MEPC 1988f).

The North Sea: A New Annex V Special Area

At the same twenty-sixth session of the MEPC, the Governments of the North Sea States submitted a proposal to the MEPC to designate the North Sea as an Annex V special area (MEPC 1988b, 1988c). The proposal was finally adopted in October 1989 at the twenty-eighth session of the MEPC.

The proposal was a result of the second International Conference on the Protection of the North Sea, which was held in London in November 1987. The North Sea States were under considerable pressure from some of their members and environmental organizations to designate the North Sea as a special area for the purposes of Annex I (oil) and Annex II (chemicals in

bulk) of the MARPOL Convention. While no agreement on this could be reached during this conference, they did in the end agree to designate the North Sea as an Annex V special area.

Is this proposal superfluous? No, there is good reason for the designation. Reports on plastics and debris in the North Sea area published about the time of the North Sea Conference (e.g., Schrey 1987) have indicated the seriousness of the situation, a situation underscored during the coffee break that followed the decision on Annex V special area status for the North Sea. As delegates to the twenty-sixth session of the MEPC watched, a rising tide brought an influx of garbage up the Thames. The Annex V special area status will contribute considerably to limiting the input of nonplastic or nonsynthetic garbage into the North Sea.

Guidelines: Particularly Sensitive Areas

Criteria and Options

Criteria for the identification of particularly sensitive areas include ecological criteria (uniqueness, dependency, representativeness, diversity, productivity, naturalness, integrity, vulnerability); social, cultural, and economic criteria (economic benefit, recreation, human dependency); and scientific and educational criteria (research interest, suitable conditions for baseline and monitoring studies, opportunities for educational activities, historic value).

Actions already under way may indicate the need for further protective measures. Consideration should be given to the beneficial effects of such measures, in view of the environmental stress from other sources.

Once an area has been identified by the IMO as a particularly sensitive area, the IMO has several options for providing it with additional protection. These include the introduction of special ships' routing measures to increase safety of navigation in or near the area such as vessel traffic separation schemes, deepwater routes, or even vessel traffic management systems. The most important instrument the IMO can use is the designation "area to be avoided."

Areas to Be Avoided

The guidelines will give substantial information about the designation of a particularly sensitive area as an area to be avoided. It is a ship's routing measure "comprising an area within defined limits in which either navigation is particularly hazardous or it is exceptionally important to avoid casualties and which should be avoided by all ships, or certain classes of ships" (IMO 1984). From a number of existing areas to be avoided, it appears to be accepted practice now that "casualties" are interpreted as environmental damage. Areas which for environmental purposes have been designated as areas to be avoided include waters near Cape Terpeniya (Sakhalin, U.S.S.R.), the waters of Nantucket Shoals (United States), a part of the Great Barrier Reef (Australia), an area near the Bermuda Islands (Great Britain), and the Northwestern Hawaiian Islands (United States) (IMO 1984).

The designation of an area as an area to be avoided is not a measure to limit discharges, yet it is consequential to such a decision that in an area where fewer ships are allowed, ships cannot discharge.

The Northwestern Hawaiian Islands (a U.S. wildlife refuge) was established as an area to be avoided after a shipping accident there pointed up the associated risk of pollution. All vessels of more than 1,000 gross tons (GT) carrying cargoes of oil or hazardous materials should avoid the area, which includes the waters within a circle radius of 50 nmi around Pearl and Hermes Reef, Lisianski Island, Laysan Island, Maro Reef, Gardner Pinnacles, French Frigate Shoals, Necker Island, and Nihoa (IMO 1984). There is a substantial area of ocean space beyond 12 and 25 nmi where certain types of garbage can legally be discharged by ships larger than 1,000 GT if these ships can enter the area.

The prevention of discharge of garbage or other marine debris by ships has, of course, not been an objective of this designation. It would nevertheless be interesting to know whether the status of these waters as an area to be avoided has contributed in any way to limit debris-associated pollution.

CONCLUSION

Reduction of discharges at the source on the basis of globally enforced discharge standards should continue to be the first choice when dealing with pollution by marine debris. However, the "guidelines for the designation of special areas and the identification of particularly sensitive areas" can nevertheless provide a useful tool in the protection of specific sea areas against this type of pollution. The designation of special areas in accordance with MARPOL Annex V should, if effectively implemented, prove to be a valuable instrument against marine debris discharged by ships. Measures such as the designation of areas to be avoided could further add to the opportunities to protect specific sea areas against marine debris.

REFERENCES

Dixon, T. R., and T. J. Dixon.
1981. Marine litter surveillance. Mar. Pollut. Bull. 12:289-295.

International Maritime Organization.
1984. General provisions on ships' routeing. Ships' routeing. 5th ed, International Maritime Organization, London.

Marine Environment Protection Committee.
1986. Report of the Marine Environment Protection Committee on its twenty-third session. Document MEPC 23/22. International Maritime Organization.
1988a. Annex 10 of the report of the Marine Environment Protection Committee on its twenty-sixth session. Document MEPC 26/25, 28 September 1988, International Maritime Organization.

1988b. Consideration of the North Sea as a special area under Annex V, submitted by the United Kingdom. Document MEPC 26/6, 2 June 1988, International Maritime Organization.

1988c. Consideration of the North Sea as a special area under Annex V, submitted by the United Kingdom. Document MEPC 26/6/1, 8 July 1988, International Maritime Organization.

1988d. Identification of particularly sensitive sea areas, including development of guidelines for designating special areas under Annexes I, II, and V, submitted by Friends of the Earth International (FOEI). Document MEPC 26/INF.20, 5 August 1988, International Maritime Organization.

1988e. Notification to IMO concerning the establishment of the Baltic Sea area as a "special area" for the purposes of Annex V of MARPOL 73/78, submitted by Denmark, Finland, the German Democratic Republic, the Federal Republic of Germany, Poland, Sweden and the USSR. Document MEPC 26/10/1, 17 June 1988, International Maritime Organization.

1988f. Report of the Marine Environment Protection Committee on its twenty-sixth session. Document MEPC 26/25, 28 September 1988, International Maritime Organization.

1989a. Information from an intervention on this issue by the Portuguese delegation during the twenty-ninth session of the Marine Environment Protection Committee of the International Maritime Organization on 16 March 1989.

1990. Report of the working group on particularly sensitive sea areas. Document MEPC 29/WP.16, 15 March 1990, International Maritime Organization.

Oslo and Paris Commissions.
1984. The Oslo and Paris Commissions, the first decade. International Co-Operation in Protecting our Marine Environment, London.

Paris Commission.
1987. The Paris Commission. Ninth Annual Report on the Activities of the Paris Commission, London.

Schrey, E.
1987. Burdening of the German Bight by ship's refuse. Forschungsbericht 102 04 327 UBA-FB 87-041 by Order of Umweltbundesamt, Berlin, November 1987.

USING THE PROTECTIVE PRINCIPLE TO UNILATERALLY ENFORCE TRANSNATIONAL MARINE POLLUTION STANDARDS

Linda M. Paul
815 Pahumele Place
Kailua, Hawaii 96734, U.S.A.

ABSTRACT

Annex V to the 1973 International Convention for the Prevention of Pollution from Ships (MARPOL) contains a broad prohibition against the marine disposal of all plastics; however, not all polluting states have ratified this treaty. While it is a principle of international law that treaty obligations are binding only upon the ratifying states, it may be possible to hold nonsignatory states equally liable for marine pollution damage prohibited by this convention under principles of customary international law. A case can be made that the general principles of liability for marine pollution damage as codified in this treaty and elsewhere represent, in fact, customary international law. Since customary international law relies on nation states to enforce its principles, liability for marine pollution damage may be enforced by national courts against all states, including those who have not yet signed or refuse to sign the international antipollution conventions.

Furthermore, a case can also be made that neither these conventions nor customary international law limits unilateral enforcement of stricter pollution standards, including enforcement on the high seas. The protective principle of international law permits a state to assert temporary jurisdiction over a person or a commercial entity whose conduct outside a state's territory threatens its national interest. By utilizing this transnational jurisdiction principle in the field of international environmental law enforcement, substance can be added to general admonitions not to pollute the high seas. As a protective principle case study, this paper analyzes the problem of renegade gillnets lost or cast aside on the high seas of the North Pacific.

INTRODUCTION

One of the tragic legacies of the 20th century is that the ocean has become a final resting place of man's waste products: oil, toxic wastes,

---

In R. S. Shomura and M. L. Godfrey (editors), Proceedings of the Second International Conference on Marine Debris, 2-7 April 1989, Honolulu, Hawaii. U.S. Dep. Commer., NOAA Tech. Memo. NMFS, NOAA-TM-NMFS-SWFSC-154. 1990.

dredge tailings, sewage, and garbage drift with the currents, wash up upon the beaches, or settle upon once productive fishing grounds. Each night in the North Pacific, fishing fleets from Japan, Korea, and Taiwan set some 48,270 to 64,360 km (30,000 to 40,000 mi) of driftnet for a total of more than 8 million km (5 million mi) a year (Wolfe 1989; Marine Mammal Commission 1990). Additional driftnet fleets set thousands of miles of large mesh driftnets in the South Pacific and driftnet fleets from Taiwan have also been reported in the western Atlantic. In addition to their targeted catch, driftnets annually entrap close to a million seabirds and tens of thousands of marine mammals. It is estimated that 30 to 50% of the fish caught and killed drop out of the nets before being brought on board. In addition, over 965 km (600 mi) of the driftnets are thought to be lost or discarded from these fisheries annually. These monofilament net fragments may continue to entrap animals for years, including populations well within the 200-mi exclusive economic zone (EEZ) and territorial waters of the United States. In an effort to document and control the destructiveness of this fishery, the United States Government has attempted repeatedly, yet for the most part unsuccessfully, to reach agreements on cooperative arrangements for research, monitoring, and enforcement of flag-state restrictions on driftnet vessels fishing the high seas (U.S. Congress 1987a; Wolfe 1989).

With an ever-growing world population, marine pollution is a problem that won't diminish and seemingly defies solution. Numerous treaties have been drafted, signed, and ratified, all of which universally condemn pollution of the marine environment and obligate nation states to honor international pollution standards (London Dumping Convention 1972; Stockholm Declaration 1972; MARPOL 1973). The problem is how to enforce the admonition. Many states have refused to sign these treaties; those that have frequently fail to enforce the treaties' provisions.

This paper begins with a general discussion of existing conventional and customary international laws of liability for transnational pollution damage. Since international law in its current state of development relies on nation states to enforce its principles, this paper focuses on the strategies available to states and their citizens to enforce both international and national marine pollution standards. One such strategy is the use of the protective principle of international law that permits a state to assert temporary jurisdiction over a person or a commercial entity whose conduct outside a state's territory threatens its national interest (Levi 1979). By utilizing this transnational principle in the field of international environmental law enforcement, substance can be added to general admonitions not to pollute the high seas.

This paper also explores one particular pollution problem as a protective principle case study: that of renegade gillnets which have either been lost or cast aside on the high seas of the North Pacific. It examines existing treaties and domestic United States legislation applicable to the gillnet problem and outlines some remedial paths that may be taken.

The paper concludes with a proposal for a liability enforcement program that will encourage both domestic fishing vessels and foreign

vessels fishing in the United States EEZ under a Governing International Fishing Agreement (GIFA) to comply with United States law prohibiting the dumping of fishing gear overboard. The implementation of a liability fund program and its financing by the owners of fishing vessels will help prevent the "loss" of drift gillnets and provide compensation for any resource and property damage resulting from discards, as well as a source of funds for resource conservation activities, including biodegradable gear research.

TREATY AND CUSTOMARY INTERNATIONAL LAW

International law comes from several sources: (1) multilateral and bilateral treaties and conventions; (2) international custom as evidenced by the practice of states; (3) general principles recognized by states and articulated by learned scholars in treatises; and (4) judicial decisions by the International Court of Justice (ICJ), other international tribunals and, to a lesser extent, the national courts of sovereign states (ICJ Statute 1945). Of all these sources, only the first, treaty law, is considered "hard law." The rest form a body collectively regarded as customary international law. Customary law, however, may be equally as binding as treaty law depending on its general acceptance by nation states and evidenced by the extent to which those states honor and enforce it. All international law, treaty, and otherwise, depends on individual sovereign states for enforcement.

Customary international law, like treaty law, is being continuously created and modified. While it used to take many decades, if not centuries, of common practice by states to establish that a certain general principle of international law imparted an obligation on all states regardless of any treaty, that process may now be accomplished in a few years. A good example is the existence of a customary law against airline hijacking. Another is the recognition that coastal states now have a right to exercise jurisdiction over the resources of a 200-mi-wide EEZ once considered part of the high seas. The rapidly increasing exploitation of the world's resources, accompanied by a corresponding degradation of the world's environment, also supports an argument that there is a rapidly growing body of customary international law that governs resource conservation and pollution abatement.

One of the general principles of international law recognized by states is that conventional law may give rights to nonparty states, but may obligate only parties to a convention. To the extent that a treaty codifies customary law, however, it is binding on all states, whether or not they are parties. In the last two decades, treaties dealing with the environment have multiplied. Most of these conventions have incorporated into them certain common principles, including the obligation of "reasonable use" of shared resources (ICJ 1974) and the obligation of a state to ensure that activities within its jurisdiction do not damage its neighbors (Stockholm Declaration 1972).

Although international environmental law may impose general obligations to protect and conserve the world's resources, it is dependent on

sovereign states to enforce the obligations. Furthermore, it is understood that while international and regional cooperative efforts to protect the environment are important and should continue, they tend to be slow and ineffective. Most states recognize that neither they nor the planet can afford to wait for committee consensus. As a result, almost every pollution convention includes provisions whereby the contracting parties not only obligate themselves to carry out the terms of the convention, but also reserve the right to take unilateral measures to protect themselves against the acts of other states that threaten their environment (International Convention for the Prevention of Pollution of the Sea by Oil (OILPOL) 1954; Brussels Liability Convention 1969; Intervention 1969; London Dumping Convention 1972; MARPOL 1973; MARPOL Protocol 1978). This treaty reservation is pervasive, and to the extent that it is backed up by states' practice, it can be considered a rule of customary international environmental law.

The unilateral measures reserved by states may include prescribing stricter environmental standards than those provided by conventional international law. The jurisdiction to enforce these stricter standards, however, can only be exercised where a state has personal or territorial jurisdiction. A state has primary jurisdiction over acts committed within its territory; it may also have jurisdiction over transnational acts that substantially affect its territory. This extraterritorial jurisdiction is based on the protective principle.

THE PROTECTIVE PRINCIPLE IN INTERNATIONAL LAW

Based on the ancient doctrine of self-defense, the protective principle permits a state to assert jurisdiction over a legal person (including corporate individuals) whose conduct outside a state's territory threatens its national interests (Levi 1979). The "Restatement (Third) of Foreign Relations Law of the United States" outlines the scope of this principle in §402:

> "A state has jurisdiction to prescribe law with respect to. . .(3) certain conduct outside its territory by persons not its nationals that is directed against the security of the state or against a limited class of other state interests." (American Law Institute 1987)

According to the "Restatement (Third)," §402 comment f, the protective principle is considered to be an application of the territorial effects principle. In the U.S. view, if an extraterritorial act produces an effect within a state's territory, that state can assert jurisdiction on the basis of territoriality. The United Kingdom takes a slightly different and more conservative view. If the commission of at least part of an extraterritorial act occurs inside a state's territory, jurisdiction can be asserted on the basis of an "objective territorial principle." When all acts are concluded outside the territory with only the effects felt within the territory, then it falls within a more limited doctrine of "extraterritorial" jurisdiction (Higgins 1984). Whether there is a real distinction between these two viewpoints depends on how jurisdiction is applied to a

particular set of facts. There apparently is no single rule of international law on the applicability of extraterritorial jurisdiction. Different rules are applied to different situations or legal relationships (Weil 1984).

The "Restatement (Third)," §403(1), however, notes that the exercise of any such jurisdiction must not be unreasonable, and §403(2)(a) further notes that states have an obligation to consider "all relevant factors," including whether the extraterritorial activity has a "substantial, direct, and foreseeable effect upon or in the territory." Additional factors to consider that are particularly relevant to transnational pollution activities are included in §402(2)(c) and (f): the importance of the regulation to the regulating state, the extent to which other states regulate such activities, and the degree to which the desirability of such regulation is generally accepted and consistent with the traditions of the international system.

THE PROTECTIVE PRINCIPLE APPLIED TO CIVIL ACTIONS

The jurisdictional regime described by the "Restatement (Third)," §402 and §403, applies to both civil and criminal actions. The civil application of the territorial effects principle to economic activity has been accepted by most Western European states, as well as Canada and Japan. European Economic Community (EEC) law has been applied to extraterritorial enterprises whose anticompetition activities have affected trade within the EEC. The EEC rules on competition, in particular those contained in articles 85 and 86 of the Treaty of Rome, apply to all agreements and practices of "undertakings" that prevent, restrict, or distort competition within the Common Market, even if those undertakings are situated in third countries (Lasok and Bridge 1987).

The United States applies the territorial effects principle in regulating the resale of technically sensitive U.S. products abroad and in antitrust restraint-of-trade actions. In *United States* v. *Aluminum Co. of America* (1945) Judge Learned Hand imposed a twofold test for the extraterritorial application of U.S. antitrust law: intent to affect the commerce of the United States and actual effect on that commerce. In *Timberlane Lumber Co.* v. *Bank of America* (1976), a Sherman Antitrust case, the court held that if commerce had in fact been affected, intent to affect was not required.

The use of the territorial effects principle to obtain relief from damaging acts committed by foreign states, as opposed to private foreign nationals, may be barred by the "act of state" doctrine. Under this doctrine, acts by sovereign states on their own territory are immune from the jurisdiction of foreign courts unless the state has expressly or by implication waived its immunity or the activity falls within the commercial exception (Akehurst 1984). The Foreign Sovereign Immunity Act (FSIA), 28 U.S.C. §1602, states that "[u]nder international law, states are not immune from the jurisdiction of foreign courts insofar as their commercial activities are concerned." Section 1603(d) of the FSIA defines "commercial activity" as "either a regular course of commercial conduct or a particular commercial transaction or act." In *Mannington Mills, Inc.* v. *Congoleum*

Corp. (1979, p. 1292), another case involving the Sherman Antitrust Act, the court held that the act of state doctrine, which would normally preclude private claims based on the contention that the damaging act of another nation violated either American or international law, does not provide a defense "where the governmental action rises no higher than mere approval." Private foreign nationals, unless they are acting as agent of the state, are not protected by the act of state doctrine and can be sued under principles of private international law.

THE PROTECTIVE PRINCIPLE APPLIED TO CRIMINAL ACTS

The United States Supreme Court first recognized the protective principle in *Strassheim* v. *Daily* (1911, p. 285). Justice Holmes defined the principle as "acts done outside a jurisdiction, but intended to produce and producing detrimental effects within it." Eleven years later, in *United States* v. *Bowman* (1922, p. 98), the Supreme Court applied the principle to a case involving a conspiracy to defraud the U.S. Government by American citizens on American ships on the high seas. The lower court had dismissed the case since the controlling criminal statute did not expressly confer jurisdiction on U.S. courts for fraudulent acts committed on the high seas. The Supreme Court reversed, holding that jurisdiction could be inferred since certain criminal statutes are "not logically dependent on their locality for the government's jurisdiction, but are enacted because of the right of the government to defend itself. . . ." In 1968, the Second Circuit Court of Appeals applied the principle in *United States* v. *Pizzarusso* (1968, p. 10), a case involving false statements made abroad by a foreign national to a U.S. consular officer for purposes of obtaining an immigrant visa. The court held that because the false statements had a "potentially adverse effect" upon U.S. governmental functions, they were sufficient to infer jurisdiction.

The bulk of U.S. case law implementing the criminal application of this principle, however, focuses on violations of customs statutes by drug smugglers and the high seas enforcement of these statutes by the U.S. Coast Guard under "Regular Coast Guard: Functions and Powers," 14 U.S.C. §89(a). Although the State Department routinely requests the consent of the foreign flag state before authorizing the Coast Guard to board a foreign commercial ship on the high seas, Federal courts have ruled that this consent is not essential if the boarding is reasonable under the fourth amendment to the Constitution (*United States* v. *Conroy* 1979; *United States* v. *Streifel* 1981; *United States* v. *Alomia-Riascos* 1987). In *United States* v. *Verdugo-Urquidez* (1990, p. 1059) the Supreme Court held that the fourth amendment does not apply to search and seizure by U.S. agents of property owned by nonresident aliens and located in a foreign country. Presumably this holding might be applied to searches and seizures of foreign vessels on the high seas under the traditional view that flag vessels are extensions of state territory. The court did not consider whether such warrantless searches and seizures had to be reasonable.

THE PROTECTIVE PRINCIPLE APPLIED TO ACTS ON THE HIGH SEAS

The high seas are a jurisdictional void. International law attempted to fill this void by creating a flag-state regime. Flag states once enjoyed

exclusive jurisdiction over ships flying their flags on the high seas under the old notion that a ship was a floating extension of a state's landed territory (Sohn and Gustafson 1984). This fiction is slowly dissolving under a growing number of exceptions, exceptions based on the protective principle and prompted by abuse of the flag-state prerogative. Many commercial ships fly "flags of convenience." By registering "ownership" in a state such as Panama or Liberia that is not a party to conventions that set international navigation, wage, safety, pollution, and resource conservation standards, shipowners can avoid compliance. This common practice belies the territorial justification for flag-state jurisdiction. In *Cunnard Steamship Co.* v. *Mellon* (1922), the U.S. Supreme Court maintained that flag-state jurisdiction "arises out of the nationality of the ship, as established by her domicile, registry, and use of the flag and partakes more of the characteristics of personal than of territorial sovereignty."

For strictly shipboard matters, the flag-state regime is still an acceptable basis for claiming jurisdiction, but when the effects of a ship's activities spread beyond the confines of the ship, flag-state jurisdiction must be qualified. Ship-generated pollution is only the latest in a long list of activities that have caused nonflag states to assert claims of jurisdiction.

Legal inroads into the tradition of exclusive flag-state jurisdiction can be found in the 1958 United Nations Convention on the High Seas (Law of the Sea (LOS) Convention 1958), a codification of customary international sea law up until that date. Article 22 of the LOS Convention (1958) acknowledges that the exclusive jurisdiction of the flag state over its vessels on the high seas is subject to some exceptions: the boarding of foreign merchant ships by warships is permitted if they are suspected of piracy, slave trading, or if they are in fact the same nationality as the warship. Article 28 of the LOS Convention (1958) also codified the protective principle embodied in the doctrine of "hot pursuit." Hot pursuit of a foreign ship is permitted when authorities of a coastal state have good reason to believe that the ship has violated the laws and regulations of that state. Coastal states are allowed to pursue offenders committing illegal acts in the territorial sea and contiguous zone out into the high seas, subject to the limitation that the pursuit be uninterrupted. Pursuit must be terminated when the ship being pursued enters the territorial sea of another coastal state.

The 1982 United Nations Convention on the LOS codified an expanding application of the protective principle in article 110, adding "unauthorized broadcasting" to the 1958 Convention's list of exceptions (LOS Convention 1982). Hot pursuit was expanded in article 111 to include the right to pursue ships committing illegal acts in the EEZ and over the Continental Shelf. In article 108, the LOS Convention (1958) acknowledges by implication that states are applying the protective principle to high seas drug trafficking and attempts to modify unilateral actions by authorizing flag states to request the cooperation of other states in the suppression of such traffic on the high seas.

THE PROTECTIVE PRINCIPLE AND JURISDICTION OVER HIGH SEAS RESOURCES

The expansion of coastal state jurisdiction over the resources of the high seas is a recent phenomenon prompted in large measure by actions of the United States. In 1945, President Truman issued two proclamations, one claiming jurisdiction over the natural resources of the United States' Continental Shelf, the other over high seas fishery resources adjacent to its territorial sea. Prompted by World War II and a growing dependence on foreign sources of fossil fuels, the President proclaimed:

> "[T]he Government of the United States regards the natural resources of the subsoil and sea bed of the continental shelf beneath the high seas but contiguous to the coasts of the United States as appertaining to the United States [and] subject to its jurisdiction and control." (Presidential Proclamation No. 2667, 1945.)

In 1953, this proclamation was enacted into law by Congress in the Outer Continental Shelf Lands Act, 43 U.S.C. §1,331-§1,343.

The second Presidential proclamation announced the policy that conservation zones would be established by treaty in areas of the high seas contiguous to the territorial waters of the United States (Presidential Proclamation No. 2668, 1945). In these zones, all fishing would be subject to U.S. regulation and control. Although nation states had been regulating the exploitation of coastal fishing stocks by treaty for more than a hundred years, overfishing still occurred, prompting the United States to invoke a unilateral policy (Sohn and Gustafson 1984). The fishing proclamation was never enacted into statutes, but the United States did thereafter conclude treaties which extended a regional jurisdictional regime over some high seas fishery resources (North Pacific Convention 1952; Halibut Convention 1953).

The Truman proclamations prompted Chile, Ecuador, and Peru to sign the Declaration of Santiago on the Maritime Zone in 1952, whereby each nation claimed complete sovereignty over a 200-mi-wide zone adjacent to its coast (Sohn and Gustafson 1984). In 1958, the High Seas Fishing Convention attempted to limit unilateral extensions of territorial jurisdiction into the high seas that were based on the protective resource conservation rationale. The convention acknowledges that coastal states have a "special interest" in the high seas resources adjacent to their territorial seas, but grants them limited preferential rights in article 6. Article 7 of the convention permits unilateral conservation measures by coastal states only if resource management negotiations between all interested parties have failed.

The concept of a 200-mi EEZ was developed by the Third United Nations Conference on the Law of the Sea in the 1970's. Simultaneously, other states unilaterally claimed their own exclusive zones. In 1972, Iceland established a 50-mi exclusive fishery zone, which was contested by the United Kingdom and the Federal Republic of Germany before the ICJ (1974). In 1976, the United States unilaterally established a 200-mi fishery conservation zone in which it assumed "exclusive fishery management authority over

all fish, except highly migratory species, and. . .authority beyond such zone over such anadromous species and Continental Shelf fishery resources" (Magnuson Fishery Conservation and Management Act (MFCMA) 1986, 16 U.S.C. §1801-§1882). Article 56 of the LOS Convention (1982) gives coastal states "sovereign rights" to explore, exploit, conserve, and manage the natural resources of a 200-mi-wide EEZ, and article 64 permits coastal state jurisdiction over highly migratory species found within that zone. Furthermore, the right to fish on what is left of the high seas is no longer absolute. The right to fish for anadromous stocks on the high seas is contingent upon negotiated agreement (article 66), and the remaining high seas fishing rights are subject to the interests of coastal states (article 116). The convention imposes on all states the duty to cooperate with other states and to take "such measures for their respective nationals as may be necessary for the conservation of the living resources of the high seas" (article 118).

The protective principle is also applied in the LOS Convention (1982) to the conservation of marine mammals. The convention specifies that "[n]othing in this part restricts the right of a coastal State. . .to prohibit, limit or regulate the exploitation of marine mammals more strictly than provided for in this part" (article 65). It also specifies that these provisions apply to the conservation and management of marine mammals on the high seas (article 120). The LOS Convention (1982) seems to sanction the high seas enforcement of coastal state conservation measures, if the high seas activities of foreign nationals "exploit" protected marine mammals.

POLLUTION ENFORCEMENT AND THE PROTECTIVE PRINCIPLE

The protective principle can also be found in the pollution provisions of the LOS Convention (1982). Exclusive flag-state jurisdiction over vessels beyond the territorial sea had not succeeded in eliminating vessel-source pollution or in protecting the environment of coastal states from it (Boyle 1985). The LOS Convention (1982) authorizes port states to investigate and prosecute foreign vessels voluntarily coming into their jurisdiction who have violated international pollution rules and standards on the high seas (article 218(1)). Presumably these standards are those embodied in the International Convention for the Prevention of Pollution from Ships (MARPOL 1973) and the International Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (London Dumping Convention 1972). This provision represents an expansion of port state jurisdiction beyond that authorized by MARPOL, which limits port states to inspection and the reporting of any violation of the 1973 convention to the flag state.

Coastal states under the LOS Convention (1982) may enforce their own pollution rules and standards against foreign vessels voluntarily coming into their ports, but only with respect to acts committed in their territorial waters and EEZ's (article 220(1)). As for stopping ships in transit passage, a coastal state may enforce its own laws for acts committed in its territorial waters (article 220(2)), but may enforce only international pollution standards for acts committed in its EEZ, provided they result "in a discharge causing major damage or the threat of major damage to the coastline or related interests of the coastal State, or to any resources of its territorial sea or exclusive economic zone" (article 220(6)).

Both port state and coastal state jurisdiction can be preempted by the flag state (article 228(1)), subject to the provision that the flag state continue the proceedings within 6 months and unless there is major damage to the coastal state or the flag state "has repeatedly disregarded its obligations to enforce effectively the applicable international rules and standards in respect of violations committed by its vessels" (article 228(2)).

The 1982 LOS Convention is not yet in force. However, aside from the provisions regarding the deep seabed in part IX, it may be considered to represent a codification of both existing and developing customary international law. Those provisions which are not found in other multilateral treaties or do not represent the practice of a majority of states are, of course, not yet part of international law. Yet most of the provisions cited above represent only an expansion of existing principles already established. For example, LOS Convention (1982) provisions dealing with marine pollution represent an extension of the standards set forth in a plethora of conventions which came into being as a result of maritime oil disasters. The obligations in each of the pollution conventions cited below are applicable only to the states' parties, but taken in aggregate, the conventions establish the right to a pollution-free environment that is shared by all states. Many of the provisions noted in the following conventions represent an emerging regime of customary international pollution law, law that is based on the protective principle.

THE PROTECTIVE PRINCIPLE IN THE MARINE POLLUTION CONVENTIONS

The protective principle is incorporated into the International Convention for the Prevention of Pollution of the Sea by Oil (OILPOL 1954: article 11), the Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties (Intervention 1969, article 1), the International Convention on Civil Liability for Oil Pollution Damage (Brussels Liability Convention 1969), the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (London Dumping Convention 1972, article 7, 13), the Protocol Relating to Intervention on the High Seas in Cases of Marine Pollution by Substances Other Than Oil (High Seas Protocol 1973, article 1), and the International Convention for the Prevention of Pollution from Ships (MARPOL 1973, article 9). For example, Intervention (1969) specifies:

> "Parties to the present convention may take such measures on the high seas as may be necessary to prevent, mitigate or eliminate grave and imminent danger to their coastline or related interests from pollution or threat of pollution of the sea by oil, following upon a maritime casualty or acts related to such a casualty, which may reasonably be expected to result in major harmful consequences" (article 1(1)).

This same provision can also be found in the High Seas Protocol (1973). "Substances other than oil" in this treaty include, inter alia, other substances "which are liable to create hazards to human health, to harm living resources and marine life, to damage amenities or to interfere with other legitimate uses of the sea" (article 1(2)).

Relevant provisions in the 1973 MARPOL Convention, conceived in the early seventies, are considerably more conservative in terms of the protective principle than current states' practice and evolving customary international law as is evidenced by the LOS Convention (1982). The MARPOL Convention, while imposing universal obligations not to pollute, essentially leaves its high seas pollution enforcement up to the flag state, limiting the port state to inspection and reporting activities. Coastal states are given the option of either reporting a violation occurring within their jurisdiction to the flag state or initiating proceedings on their own (MARPOL 1973, article 4(2)). The extent of coastal state jurisdiction, however, was the source of considerable controversy during the drafting of the treaty. The issue was never resolved, and as a result the phrase "within the jurisdiction of any Party" (article 4) must be interpreted according to current interpretations of the term in international law (Timagenis 1980).

The MARPOL negotiators also disagreed over the power of states to take stricter regulatory measures than those expressly provided for in the convention. The compromise text, adopted by a majority of the delegates, but not by the required two-thirds, provided that

> "(1) Nothing in the present Convention shall be construed as derogating from the powers of any Contracting state to take more stringent measures where circumstances so warrant, within its jurisdiction, in respect of discharge standards" (article 8, now article 9).

In its final form, MARPOL defers to future decisions by the United Nations Conference on the LOS, stipulating only that nothing in MARPOL "shall prejudice. . .the present or future claims and legal views of any State concerning the law of the sea and the nature and extent of coastal and flag State jurisdiction" (article 9(2)). It leaves interpretation of the term "jurisdiction" up to customary international law (article 9(3)).

With the failure of the compromise text, Australia reserved the right to impose unilateral conditions within its jurisdiction to protect its "adjacent" marine environment from pollution (Timagenis 1980, p. 503). The Canadian delegation stated that since there was no provision restricting the powers of the contracting states to take measures within their jurisdiction, the Canadian Government reserved the right "to take any and all measures within its jurisdiction for the protection of its coasts and the adjacent marine environment from pollution from ships" (Timagenis 1980, p. 505). Ireland and the Philippines made similar statements (Timagenis 1980, p. 506).

THE PROTECTIVE PRINCIPLE AND STATES' PRACTICE--A CANADIAN EXAMPLE

In 1970, Canada unilaterally implemented the protective principle in response to a pollution threat to its Arctic coastline. Fearful of a devastating accident associated with the United States' development of the Alaskan North Slope and the use of the Northwest Passage for transport of crude oil to refineries on the east coast, the Canadian Parliament passed

the Arctic Waters Pollution Prevention Bill, extending Canadian jurisdiction 100 nmi into the Beaufort Sea for purposes of regulating marine pollution. The act held both prospector and ship owner liable for all costs associated with any discharge of wastes into this region (Canadian Arctic Waters Pollution Prevention Bill 1970). In reply to a protest letter from the United States, the Canadian Government responded "that a danger to the environment of a state constitutes a threat to its security. . . . The proposed anti-pollution legislation is based on the overriding right of self-defense of coastal states to protect themselves against grave threats to their environment" (Canadian Reply 1970). This unilateral declaration caused considerable controversy in the world community. The 1982 LOS Convention resolved the controversy with a special provision granting coastal states the right to adopt and enforce laws and regulations to prevent and control pollution in ice-covered areas within the EEZ (article 234).

THE PROTECTIVE PRINCIPLE IN UNITED STATES ENVIRONMENTAL LEGISLATION

In 1961, Congress passed the Oil Pollution Act, 33 U.S.C. §1001-§1015, implementing OILPOL. Over the next decade the convention was amended and more legislation was enacted as marine pollution and public awareness grew. In 1974, the Intervention on the High Seas Act, 33 U.S.C. §1471-§1487, implemented Intervention 1969 and its companion treaty dealing with substances other than oil. This legislation, extending the protective principle to pollution activities on the high seas, empowers the United States to take measures to "prevent, mitigate or eliminate" danger to its coastline caused by oil pollution casualties on the high seas when they "may reasonably be expected to result in major harmful consequences" (§1472).

The 1973 version of MARPOL did not enter into force before it was superseded by the Protocol of 1978, which extensively modified Annex I (Regulation for the Prevention of Pollution by Oil) and Annex II (Regulations for the Control of Pollution by Noxious Liquid Substances in Bulk). The modifications in the pollution prevention standards were the result of an international conference convened at the request of the United States following 16 major tanker accidents in waters around the United States in 1976-77 (U.S. Congress 1980). Although the MARPOL Protocol did not come into force until 1983, many of its provisions were immediately implemented by Congress in the Port and Tanker Safety Act of 1978, 33 U.S.C. §125, §128-§1232 and 46 U.S.C. §391(a), §1221, §1224. The Senate ratified the 1978 MARPOL Protocol in 1980 and implemented the balance of its provisions that year in the Act to Prevent Pollution from Ships, 33 U.S.C. §1901-§1911. The other three original MARPOL annexes are optional. Annex III and Annex IV have not been ratified by the United States and are not in force.

Annex V of the original 1973 MARPOL Convention came into force in December 1988, with U.S. ratification. Not revised by the Protocol of 1978, Annex V prohibits the disposal at sea of garbage and plastic waste; however it excepts the accidental loss of synthetic fishing nets incidental to the making of repairs from its general prohibition. Congress implemented Annex V on 29 December 1987 with an amendment to the Act to Prevent Pollution from Ships, adding simply the word "garbage" to its list of prohibited discharges, 33 U.S.C. §1907(d)(1) and (e)(1). Although the

Annex V amendments continue to defer to the flag-state enforcement scheme of the MARPOL Protocol as enacted into U.S. law in 1980 (§1907(c)), they also include a preemption requirement mandating that "[e]xcept as specifically provided. . ., nothing in this title shall be interpreted or construed to supersede or preempt any other provision of Federal or state law. . .[or] any State from imposing any additional requirements" (33 U.S.C. §1901(a)).

The MFCMA regulations regarding fishing gear disposal were also amended in 1987. Previously these regulations had exempted all accidental gear loss from its general prohibitions. Now any gear discards, including accidental discards, are strictly prohibited except in case of emergency or with specific Coast Guard authorization (50 C.F.R. §611.12). This is a stricter discard standard than that of MARPOL Annex V.

In conjunction with implementation of Annex V, Congress also enacted the Driftnet Impact Monitoring, Assessment, and Control Act of 1987, 16 U.S.C. §1822. This act requires the Secretary of Commerce to assess the impact of driftnets on U.S. marine resources and the Secretary of State to initiate

> "negotiations with each foreign government that conducts, or authorizes its nationals to conduct driftnet fishing that results in the taking of marine resources of the United States in waters of the North Pacific Ocean outside of the exclusive economic zone and territorial sea of any nation, for the purpose of entering into agreements for effective enforcement of laws, regulations, and agreements applicable to the location, season, and other aspects of the operations of the foreign government's driftnet fishing vessels." (16 U.S.C. §1822)

The act further specifies that if the foreign government fails to enter into and implement such an agreement within 18 months, certification under the Pelly Amendment will result (16 U.S.C. §1822, 22 U.S.C. §1978(a)). The Pelly Amendment provides that when the nationals of a foreign country, directly or indirectly, are (1) conducting fishing operations in a manner or under circumstances which diminish the effectiveness of an international fishery conservation program, or (2) engaging in trade or taking which diminishes the effectiveness of any international program for endangered or threatened species, the Secretary in charge of the finding shall certify the fact to the President. The President in turn may then direct the Secretary of the Treasury to prohibit the bringing or importation in the United States of fish products of the country whose nationals are engaging in such conduct (22 U.S.C. §1978(a)).

Congressional intent on the extent of jurisdiction can be found in the final committee report to the House. The Merchant Marine and Fisheries Committee expressly stated that no extension of U.S. jurisdiction was to be construed by passage of the legislation. It affirmed, however, "the sovereign rights of the United States to conserve and manage marine resources within its exclusive economic zone and anadromous species on the high seas to the extent provided for in United States law" (U.S. Congress 1987a).

UNITED STATES MARINE RESOURCE CONSERVATION ENFORCEMENT AND THE PROTECTIVE PRINCIPLE

In only a few instances has the United States asserted through active enforcement the protective principle codified in its various conservation and pollution laws. Current case law reveals an enforcement focus on violations of the MFCMA in the EEZ by foreign fishing nations signing GIFA's with the United States. A GIFA is an executive agreement between the United States and a foreign state which gives the foreign state the right to fish for specified quantities of designated species in the United States EEZ for a specified period of time. In return, the foreign fishing nation agrees to abide by the terms of the MFCMA (Japanese GIFA 1982; Korean GIFA 1982; Taiwanese GIFA 1982). Consent to be boarded and inspected for suspected violations, included in the agreement, considerably simplifies jurisdictional questions. Federal courts have assumed GIFA jurisdiction for violations of the MFCMA in the EEZ in *United States* v. *Tsuda Maru*, 470 F.Supp. 1223 (D. Alaska 1979); *United States* v. *Marunaka Maru No. 88*, 559 F.Supp. 1365 (D. Alaska 1983).

The signatory state also must agree to comply with any administrative measures taken in accordance with the agreement and to pledge not to kill or harass any marine mammal within the EEZ without express authorization. If the state fails to agree to acceptable monitoring and enforcement arrangements, the Secretary of Commerce has the authority to deny fishing permits to any of its vessels. In addition, Federal regulations implementing the MFCMA prohibit a foreign fishing vessel from throwing overboard any article that may damage any marine resource, including marine mammals and birds (50 C.F.R. §611.12(c)). This regulation is now reinforced by legislation implementing Annex V of the MARPOL treaty.

A GIFA is enforced by both overflight and boarding inspections by the Coast Guard and by placing National Marine Fisheries Service (NMFS) observers on board some foreign vessels fishing in the EEZ. A few observers have also been placed on the Japanese salmon mothership fleet operating in the high seas of the North Pacific (Marine Mammal Commission 1990). In addition, three United States observers were permitted to observe commercial squid driftnet operations on board Japanese vessels in 1982 (Cary and Burgner 1983) and 1986 (Tsunoda 1989) and on a Korean vessel in 1988 (Gooder 1989). A few additional observations have been made by observers from the vantage point of Coast Guard cutters (Ignell et al. 1986) and private vessels. In 1989, following a mandate from Congress (Driftnet Impact Monitoring, Assessment, and Control Act 1987) agreements were concluded with Japan, Korea, and Taiwan to place a few observers on board commercial driftnet vessels. Japan agreed to allow 9 United States and 5 Canadian observers on board 14 of its commercial squid driftnet vessels during the 1989 season (Japan-United States Agreement 2 May 1989). Agreements with Korea and Taiwan were concluded too late to implement a foreign observer program for 1989. Korea agreed to deploy "at least 13" United States observers on board its "commercial driftnet vessels for at least 45 days each to observe 45 or more driftnet retrievals on each vessel" (Republic of Korea-United States Agreement Annex II, 13 September 1989). Taiwan agreed only to deploy "observers of the parties. . .aboard

commercial driftnet vessels. . .for at least 30 days to observe 30 or more driftnet retrievals on each vessel" (American Institute of Taiwan-Coordination Council for North American Affairs Agreement article VII, 13 July 1989).

Data from the joint Canadian-Japan-United States observer program were collected between early June and early October 1989, by observers on board commercial Japanese driftnet vessels chosen by lot fishing between long. 170°E and 145°W, and between lat. 36° and 45°N. The results were released on 30 June 1990 (Joint Report Fisheries Agency of Japan, Canada Department of Fisheries and Oceans, NMFS, and Fish and Wildlife Service (FWS) 1990). In summary 1,402 operations were observed involving 1,427,225 tans of net (50-m each). The catch included 3,119,061 neon flying squid, 914 dolphins, 22 marine turtles, 9,173 seabirds, and 1,580,068 nontargeted fish, including 79 salmonids, 1,433,496 pomfrets, 59,060 albacore, 10,495 yellowtail, 7,155 skipjack tuna, and 58,100 blue shark. The data did not indicate what percentage of the huge incidental catch of assorted fishes were actually brought on board and kept.

Estimates of incidental catch rates of nontargeted species vary greatly depending on the year, the vessel, its location, the time of year, who is doing the reporting, and the proximity of the observer. The total number of sets observed and recorded is extremely small compared to the total amount of driftnet fishing actually done. Obtaining statistically significant data may be an impossible goal. Between 1978 and 1983 the amount of fishing effort by the driftnet fleet rose dramatically and exponentially; since then it has increased much more gradually. Thus the maximum incidental catch of long-lived species such as marine mammals and turtles would have occurred in the early eighties at a time when practically no data were being kept. Incidental catches today probably reflect the impact of driftnet fishing on much reduced populations. Fishermen have also been observed shaking undesired species free of the nets before hauling them on board (Gooder 1989; Tsunoda 1989), a factor which would distort vessel owners' reports of total incidental takings. Although there have been few observations of torn netting being discarded at sea, this may have been influenced by the fact that observers were watching.

In 1984, a NMFS observer on board a Japanese vessel fishing in the EEZ near Dutch Harbor, Alaska, saw its crew members on five separate occasions toss several 0.45 × 0.76-m (1.5 × 2.5-ft) fragments of synthetic trawl netting overboard. At a hearing before a National Oceanic and Atmospheric Administration (NOAA) administrative law judge, expert testimony revealed that some 30% of documented fur seal entanglements involve net fragments in the same size range as those discarded and some 40% of the seals caught in such net fragments die (*In the Matter of Kenji Nakata, Ohoura Gyogyo Co. Ltd.*, 4 O.R.W. 814 (NOAA 1987)). In his decision, the judge indicated that every vessel discarding such net fragments must be held responsible for the cumulative effect on the fur seal population and that the civil penalties assessed for such violations must be large enough to serve as a deterrent and not be considered as a mere cost of doing business. The owners of the offending vessel were fined $15,000 total for two violations. The MFCMA authorizes up to $25,000 assessment for each violation (16 U.S.C. §1858(a)).

Although it has been asserted that lost sections of driftnet ball up within a week and thus no longer ghost fish, evidence indicates that tangled driftnets continue to ghost fish, both on the surface (DeGange and Newby 1980; Henderson 1984; von Brandt 1984; Gooder 1989) and on the bottom (Way 1977; Carr and Cooper 1987). In 1978, a 3,500-m section of lost driftnet was found floating in the North Pacific (lat. 49°15'N, long. 168°14'E). Entangled within the 1,500 m brought on board were 75 newly snared salmon and at least twice that many rotten ones, plus assorted other fish and some 99 seabirds (DeGange and Newby 1980). Endangered Hawaiian monk seals have also been found entangled in masses of monofilament driftnet (Henderson 1984).

THE NORTH PACIFIC DRIFTNET FISHERY--A CASE FOR APPLICATION OF THE PROTECTIVE PRINCIPLE

The 20th century development of nylon and plastics has greatly benefited human "progress" and greatly burdened the global environment. Except for the hulls of vessels, plastics dominate the fishing industry: polystyrene and polyurethane foams are used for flotation in lifejackets and fishnet floats; polyethylene is used to make cable coverings, buckets, packaging film, and shipping containers; polyamide (nylon), polyester, polyethylene, and polypropylene are used for ropes and nets (Pruter 1987). Gillnets, one of the most efficient fishing methods ever developed, are made of monofilament nylon. Strong, transparent, and durable, nylon is the perfect material for constructing the miles of pelagic drift gillnets used by high seas salmon and squid fishermen. Gillnets are also cheap, difficult to mend, and easily replaced, usually after only one season of use (Eisenbud 1985). Pelagic gillnets are made in panels 6-8 m deep and may be over a 100 m long. These individual panels are strung together by the fishermen on lines with floats on surface and weights on the bottom to create an invisible wall which may stretch for miles. Set at night, the gillnets are either left to drift free until the following morning, or remain attached to the catcher boat at one end.

There are two Japanese salmon driftnet fisheries: a mothership fishery in the Bering Sea and a land-based fishery that operates south of the Aleutian Islands. They are regulated by the International North Pacific Fisheries Commission, established to implement the provisions of the 1952 North Pacific Convention. The North Pacific Convention is a tripartite agreement between the United States, Canada, and Japan to: "1) ensure cooperation in scientific research and data collection on salmon and other fish species in the North Pacific Ocean and Bering Sea; 2) minimize interceptions of North American origin salmon by Japan; and 3) facilitate cooperation in marine mammal research" (Beasley 1984). Each party agreed to enact and enforce the necessary domestic laws and regulations to implement the convention provisions (North Pacific Convention, article 9(2); 16 U.S.C. §1021-§1035).

In 1976, the MFCMA claimed exclusive management authority over anadromous species of U.S. origin throughout their range, unless they are within the jurisdiction of another nation (16 U.S.C. §1812). The MFCMA required that the North Pacific Convention be renegotiated to the extent that it was in conflict with the act (16 U.S.C. §1822(b)). In 1978 a

protocol was signed amending the North Pacific Convention and shifting the eastern boundary of the salmon mothership fishing area from long. 175°W to 175°E, except for a small enclosed area of high seas in the middle of the Bering Sea known as the donut hole (North Pacific Convention Protocol 1978). The Japanese land-based fleet is limited to an area south of lat. 46°N east of long. 170°E, and south of lat. 48°N west of long. 170°E. The Japanese also have a treaty with the Soviet Union which excludes all salmon fishing within the Soviet EEZ and regulates high seas salmon fishing outside of this zone (Japan-U.S.S.R. 1956). In May 1990, the Soviet Union seized a fleet of more than 10 "North Korean" driftnet vessels for harvesting thousands of tons of Soviet salmon. The fleet had previously been spotted by the U.S. Coast Guard fishing south of the Aleutian Islands. North Korea is not a party to any of the North Pacific fishing agreements. Following arrest it was discovered that the fleet and more than 140 fishermen were actually Japanese and were fishing under the North Korean flag to circumvent treaty restrictions.

The high seas driftnet fisheries are condemned by many as an economically inefficient method of fishing. They catch salmon before they reach full size and can bring the maximum market price, as well as nontargeted species, which are discarded; 50% of the fish caught are estimated to drop out of the nets before they can be brought on board; the various salmon stocks mingle on the high seas making it almost impossible to manage individual stocks; and driftnets are lost or discarded at sea where they continue to entrap fish (Sathre 1986). Furthermore, the high seas squid driftnet fisheries of Japan, the Republic of Korea, and Taiwan have high "incidental" catches of salmon which may not be so incidental (the Japanese squid fishery uses driftnets similar to those used by the salmon fishery) (Anderson 1989; Matsen 1989). Begun in 1978, the Japanese squid fishery now extends across much of the North Pacific and by agreement is supposed to stay in waters too warm for salmon (15°-22°C). However, the Coast Guard has sighted numerous Japanese vessels fishing north of the boundaries established by Japanese regulations (Gordon 1985). Furthermore, neither the Republic of Korea nor Taiwan is bound by the 1978 Protocol's salmon fishing boundary restrictions, although Taiwan has agreed to respect a squid fishing boundary similar to Japan (Gordon 1985). In 1988, the Soviets seized three Taiwan driftnet vessels reportedly carrying 3,357,000 kg (9 million lb) of immature salmon (Anderson 1989). As for MARPOL prohibitions against abandoning old driftnets, only Japan is currently a party to Annex V.

Driftnets fish indiscriminately. While mesh size is targeted for a particular species, the nets are capable of catching almost anything that swims or dives: small whales, porpoises and dolphins, seals and sea lions, turtles, and almost every kind of diving seabird have been found trapped in them (DeGange and Newby 1980). Lost and discarded net sections from high seas gillnet fisheries frequently drift into the U.S. EEZ and continue to entrap large numbers of migratory seabirds and marine mammals. This gear may ghost fish for years before settling on the bottom or washing up on a beach. Although the "act" of losing this deadly gear may have occurred on the high seas, the effect constitutes a taking of migratory seabirds and marine mammals within U.S. EEZ and territorial waters that is in direct

contravention of both treaty and U.S. domestic law. This entrapment of birds and mammals by ghost nets drifting into the EEZ is arguably illegal under the "taking" provisions of the Marine Mammal Protection Act (MMPA), 16 U.S.C. §1361-§1407, the Endangered Species Act (ESA), 16 U.S.C. §1531-§1542, the North Pacific Fur Seals Act, 16 U.S.C. §1151-§1175, and the Migratory Bird Treaty Act (MBTA), 16 U.S.C. §703-§712.

The MMPA defines the term "take" as meaning to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal (16 U.S.C. §1362(12)). Pursuant to this act, a permit is required for any incidental take of marine mammals in the course of commercial fishing operations (§1362(14)). The goal, however, is that incidental takes "be reduced to insignificant levels approaching zero" (§1371(a)(2)). The MMPA also authorizes the Secretary of the Treasury to ban the importation of fish products from fish which have been caught using technology that results in killing or seriously injuring marine mammals "in excess of United States standards" (§1371(a)(2)). Amendments to the MMPA passed in 1988, however, permit exemptions from the incidental taking provisions until 1 October 1993, provided that fishing vessels keep detailed annual records of all such takings (Public Law 100-711, 23 November 1988, adding §114; 50 C.F.R. part 229).

The ESA was created to "provide for the conservation, protection and propagation of endangered species of fish and wildlife by Federal action. . ." (U.S. Congress 1973). The ESA makes it "unlawful for any person subject to the jurisdiction of the United States to take any protected species on the high seas" (16 U.S.C. §1538(a)(1)(C)). Any exceptions require permits (16 U.S.C. §1539 and 50 C.F.R. §10.1 et seq.). The ESA further authorizes the Secretaries of Commerce and State to enter into bilateral or multilateral agreements for the protection and conservation of endangered and threatened species and to encourage citizens of foreign states "who directly or indirectly take fish or wildlife or plants in foreign countries or on the high seas for importation into the United States for commercial purposes. . .to carry out. . .conservation practices designed to enhance such fish or wildlife or plants and their habitat" (16 U.S.C. §1537(b)). The enforcement provisions of the ESA permit any U.S. citizen to bring a civil suit to enjoin any person, including the United States Government, who may be in violation of the ESA (§1540(g)). Worldwide service of process may be implied in the language of the ESA, 16 U.S.C. §1540(c), which specifies that "the several district courts of the United States. . .shall have jurisdiction over any action arising under this chapter." According to reporters' notes 7 and 9 of §421 of the Restatement (Third), where nationwide jurisdiction is conferred by statute, jurisdiction of a Federal court no longer depends on the laws of the state where the court sits. Evidence of an intent to apply the ESA extraterritorily has been found by courts (*Defenders of Wildlife* v. *Hodel* 1989) in the broad definition of "endangered species," §1532(6), which includes many species not native to or present in the United States, along with §1538(a)(1)(C), which prohibits takings on the high seas, coupled with §1532(13), which defines "persons" to include foreign governments.

Japan and the United States are parties to the bilateral 1972 Migratory Bird Convention, which prohibits the taking of migratory birds in

the territories of both countries (Migratory Bird Convention 1972). The annex to the convention lists 189 protected species; virtually all are species listed in regulations implementing the ESA and the MBTA (50 C.F.R. §10.13). In addition to prohibitions, the convention also includes some affirmative duties. The Migratory Bird Convention mandates that each contracting party "shall (a) [s]eek means to prevent damage to such birds and their environment, including, especially, damage resulting from pollution of the seas. . ." (article 6(a)). Article 6(a) also specifies that "[e]ach Contracting Party agrees to take measures necessary to carry out the purposes of this Convention." Of the 800,000 seabirds estimated to die each year in the gillnets of the Japanese mothership and land-based salmon fisheries of the North Pacific, many belong to species that are listed in the Migratory Bird Convention Annex (U.S. Congress 1987b). Data from the 1989 Canadian-Japan-United States squid driftnet observer program included birds from at least five species listed in the annex (331 Laysan albatrosses, 38 northern fulmars, 20 horned puffins, 5 tufted puffins, and 17 Leach's storm petrels). Ghost driftnet data have also reported catches of listed birds. In one mass of tangled driftnet, DeGange and Newby (1980) identified birds from 6 listed species (4 Laysan albatrosses, 15 northern fulmars, 15 tufted puffins, 14 sooty shearwaters, 40 slender-billed (short tailed) shearwaters, and several fork-tailed storm petrels).

The Migratory Bird Convention is implemented in part in the MBTA (16 U.S.C. §703-§712. The MBTA prohibits the taking of listed migratory birds without a permit from the Department of the Interior (16 U.S.C. §703 and 50 C.F.R. §10.13 and §21.11). In recent testimony given by the Department of the Interior on driftnet takings of migratory seabirds by the Japanese salmon fisheries, there was no mention of any permits having been issued (Lambertson 1985), possibly because the FWS does not believe it has jurisdiction. However, under customary international law, as codified in the 1982 LOS Treaty and recognized as such by Presidential Proclamation No. 5030 on 10 March 1983, the United States has jurisdiction over all "living resources" of its EEZ. The term "marine resources" has been defined by Congress in the 1986 amendments to the MFCMA as including "fish, shellfish, marine mammals, seabirds, and other forms of marine life or waterfowl."

Japan is also a party, along with the Soviet Union, Canada, and the United States, to the 1957 Interim Convention on the Conservation of North Pacific Fur Seals prohibiting the taking of fur seals in the North Pacific Ocean (Fur Seal Convention 1957). The Fur Seal Convention empowers any party to board and inspect another party's fishing vessel anywhere except in territorial waters if there is reasonable cause to suspect that the vessel is violating the prohibition against sealing (article 6). Pelagic "sealing" is defined as the killing, taking, or hunting in any manner whatsoever of fur seals at sea" (article 1). If the suspicion is well founded, the vessel may be seized and the persons on board arrested. Judicial proceedings, however, are left to the flag state. This treaty has been enacted into U.S. law in the North Pacific Fur Seals Act, 16 U.S.C. §1151-§1175. The act, however, permits U.S. flag fishing vessels to refuse boarding if they are within the U.S. EEZ (§1152). Fur seals are, of course, also covered under the MMPA. Although the NMFS has issued permits to GIFA holders for the incidental taking of fur seals and sea lions, NMFS was enjoined by an order of the U.S. District Court in Washington, D.C., from

issuing a permit for the 1988 season (*Kokechik Fishermen's Association* v. *Secretary of Commerce*, 839 F.2d 795 (D.C. Circuit 1988)). The court ruled that the northern fur seal, *Callorhinus ursinus*, incidentally taken by the Japanese mothership salmon driftnet fleet are depleted below optimum levels and that the MMPA prohibits the issuance of a permit to take any such depleted marine mammals.

ACTION TO BAN DRIFTNETS BY THE INTERNATIONAL COMMUNITY

Several foreign states have already taken action to ban driftnet fishing in waters under their jurisdiction, including Japan, Australia, Canada, the Cook Islands, the Federated States of Micronesia, New Zealand, Peru, French Polynesia, American Samoa, and Vanuatu. In July 1989, the South Pacific Forum states signed the Tarawa Declaration, which expressed regret that Japan and Taiwan "failed to respond to the concerns of regional countries" about pelagic driftnet fishing and called for a ban on driftnet fishing in the South Pacific. Korea had already announced its intention to withdraw its driftnet vessels from the South Pacific area. In November 1989, several South Pacific states signed the Convention for the Prohibition of Fishing with Long Driftnets in the South Pacific. The convention bans driftnet fishing within the 200-mi EEZ's of the signatory states and within certain adjacent high seas areas. In December 1989, the United Nations General Assembly unanimously adopted a resolution that condemns the commercial use of driftnets and calls for a ban on driftnet fishing in the South Pacific, beginning 1 July 1991, and a worldwide ban beginning 30 June 1992. [On 26 June 1990, Taiwan announced that it would prohibit its driftnet fleet from fishing in the South Pacific by July 1991.]

REMEDIES FOR VIOLATIONS OF INTERNATIONAL ENVIRONMENTAL STANDARDS

If activities within a state's jurisdiction cause significant damage to its neighbors or the common environment, that state is responsible to all injured states for violation of its obligations. A state may be obligated by either treaty or customary international law. If the obligation is owed to the international community as a whole, any state may bring a claim before the ICJ without showing that it has suffered a particular injury (American Law Institute 1987, §902(1), §602 comment a). Consent to jurisdiction of the ICJ by the defendant state is not necessary under the Statute of the ICJ. In general, the state seeking redress has the burden of proving the existence of an international obligation and its breach; the responding state has the burden of establishing any justification or excuse. The burden of proof may shift to the party that has control of the evidence (American Law Institute 1987, §901 comment a). Thus any state may call on the violating state to terminate activities which are causing significant injury to the general environment.

If the obligation is owed to a particular state or states, the injured states may also file international claims. Treaties generally include a dispute resolution clause in their text. If the method chosen does not produce results, or if there is no such clause, the injured state(s) may take its grievance before an international tribunal with the consent of the responding state or the ICJ without the responding state's consent. The enforcement power of the ICJ, however, is that of world opinion and

voluntary compliance by sovereign states. If a citizen of a state has a cause of action, it must be taken up by his parent government before the ICJ. Article 34 of the Statute of the ICJ gives it jurisdiction only over states. The injured person must also have exhausted local remedies (American Law Institute 1987, §703 comment b).

A state may also sue a fellow sovereign state in any domestic court that will accept jurisdiction, but because of the principle of sovereign immunity, domestic courts will generally accept jurisdiction only if a state waives its sovereign immunity or if the offending acts attributable to the state involve commercial activities (Foreign Sovereign Immunities Act, 28 U.S.C. §1605(a)(2)). Because of the vagueness of customary international law and the domestic court's general unfamiliarity with it, plus the fact that, at least in the United States, foreign policy issues are reserved to the executive branch, adjudication in a domestic forum stands a better chance of success if arguments are based on domestic law.

Private persons, including organizations, may also bring suit when international environmental standards are violated. Injured persons may bring a claim directly against a foreign state in an international forum when that state has consented to the forum's jurisdiction, or in any domestic court that will accept jurisdiction (American Law Institute 1987, §906, §907). In the United States, Federal courts have jurisdiction over cases arising under international law and international agreements of the United States. However, "international agreements, even those directly benefiting private persons, generally do not create private rights or provide for a private cause of action in domestic courts" unless the provisions are "self-executing" (American Law Institute 1987, §907 comment a).

Whether a treaty of its own force makes law depends on two requirements: (1) the treaty-drafters must have intended that the treaty provision be self-executing as ascertained by the applicable international rules of treaty interpretation (Vienna Convention on the Law of Treaties 1969) and (2) the treaty provision in question must have the force of legislation without any further action by a legislative body (Henry 1928). Treaty obligations not to act, or to act only subject to limitations, are generally self-executing. Self-executing obligations may also arise under customary international law. In conjunction with driftnet fishing there are two customary obligations that may be considered self-executing: (1) "fisheries for anadromous stocks shall be conducted only in waters landward of the outer limits of exclusive economic zones" (LOS Convention 1982, article 66(3)(a)) and (2) "the taking of endangered species is prohibited" (implied in a whole host of multilateral and bilateral treaties). Rules of customary international law are part of U.S. law and as such may permit domestic remedies. Again, suits against foreign states may be barred by sovereign immunity unless there is a waiver or the activity falls within the commercial exception.

Private persons can also bring claims directly against private foreign polluters. The chief hurdle is obtaining personal jurisdiction over the polluter. While filing suit in the foreign polluter's home state may cure this problem, it may cause others. The laws and courts of that state may be less than friendly and the costs and inconvenience of doing so are

usually a severe limitation. Procedural and discovery problems are also magnified in transnational cases.

In the United States, citizens and private organizations may also sue their government, its agencies, and its officials for nonenforcement of environmental laws which implement treaty provisions. The Act to Prevent Pollution From Ships, 33 U.S.C. §1910(a), permits any person having an interest adversely affected to bring an action not only against a private violator, but against the Coast Guard for failure to perform a nondiscretionary act and the Secretary of the Treasury for failure to enforce the ship clearance provision (§1908(e)). The ESA allows a citizen to sue (A) to enjoin any person, including the United States or its agencies, if it is in violation of the ESA; (B) to compel the Secretary of the Interior to apply ESA prohibitions with respect to the taking of any threatened species; and (C) the Secretary if he fails to perform a nondiscretionary duty (16 U.S.C. §1540(g)(1)). Other legislation may also permit citizens to sue public officials for acts which are arbitrary, capricious, involve an abuse of discretion or are contrary to law (Administrative Procedure Act, 5 U.S.C. §553, §701 et seq.). Citizens may or may not be able to recover attorney's fees (33 U.S.C. §1910(d), 16 U.S.C. §1540(g)(4)).

Adjudication has many advantages, including the availability of immediate injunctive relief when it is needed and serving as a catalyst for change by goading inactive commissions, legislatures, and the public into action. Adjudication can also prevent further damage. However, there are other, less confrontational methods of mitigating or preventing environmental harm. One of these methods is the liability fund.

A LIABILITY ENFORCEMENT PROGRAM TO DISCOURAGE GEAR LOSS

Liability funds to compensate for damage caused by environmental pollution are not new to the oil and ultrahazardous waste industries, but are a new idea for curing generally pervasive types of environmental pollution such as acid rain and the disposal of garbage at sea. They have the virtue of serving both as a deterrent to future pollution, if set at punitive levels, and as a source of funds for those damaged by the polluting party's activities. They are also in line with the liability provisions contained in the LOS Convention (1982, article 235). The convention includes compulsory insurance and compensation funds as methods that states should employ in order to provide adequate compensation for pollution damage caused by persons under their jurisdiction (article 235(3)). A liability enforcement program such as the one that follows should encourage both domestic fishing vessels and foreign vessels fishing in the U.S. EEZ under a GIFA to comply with U.S. law prohibiting the dumping of fishing gear overboard. The conclusion of bilateral and multilateral liability fund agreements with high seas fishing nations who have not signed GIFA's should also be considered.

Specifically, the owner of a fishing vessel fishing in the EEZ would be entitled to limit his liability for lost driftnets and any damage caused by them if he constitutes a fund for the total sum representing the limit of his liability. The fund can be constituted either by depositing the sum with the administering agency or by producing an acceptable bank guarantee

or proof of insurance. The liability ceiling would be established according to the risk each fishing enterprise poses to the resource. The risk can be calculated using conventional measures of fishing effort: size and number of vessels, amount and type of gear, and number of days fished.

Control methods would utilize an inventory reporting system to account for all gear purchases, gear retirement, and "lost" gear. Penalties for lost gear would be paid out of the fund. Credit and a lowering of total liability would be awarded for expenditures made for conservation measures such as investing in gear with biodegradable panels and knots. Failure to report could result in a tripling of the normal penalties assessed and a doubling of the liability ceiling. Exceptions may be made for natural disasters and intentional acts by third parties.

A liability fund has several advantages. For the fisherman, contributions can be internalized as a cost of doing business; fishing vessels will no longer be subject to seizure for violations and judgment payments; other assets will be immune from attachment; and fishery allocations will not be jeopardized for inadvertent gear loss. For those specifically injured by renegade gear, the fund will provide a source of compensation for resource and property damage. For the government, proceeds from penalties assessed may be used to finance resource conservation activities and the development of traceable and biodegradable fishing gear. The fund also would be easier to enforce than current methods of trying to catch vessels in the act of discarding gear on the high seas.

CONCLUSION

While additional information on the effects of driftnet fishing is useful, it is not necessary in order to legally proceed against persons whose high seas fishing activities damage the coastal resources of the United States. The effective management of marine resources within the EEZ necessitates that the United States regulate foreign fishing activities on the high seas and in fact legislation already exists that implements this application of the protective principle. Although there are as yet few cases where the United States has extended the protective principle codified in its various conservation and pollution laws to the high seas, such an extension is already legal under both domestic and international law. If the protective principle can be used to enforce narcotics laws on the high seas, it can be used to enforce environmental laws.

The Stockholm Declaration on the Human Environment (1972) directs states to "take all possible steps to prevent pollution of the seas by substances that are liable to. . .harm living resources and marine life. . ." (article 7). The doctrine of "reasonable use" of the high seas, addressed in a 1974 decision by the ICJ, establishes that "[t]he former laissez faire treatment of the living resources of the sea in the high seas has been replaced by recognition of a duty to have due regard to the rights of other states and the need of conservation for the benefit of all" (ICJ 1974, p. 175). It is the role of international treaties and tribunals to establish global environmental standards; it is the role of individual sovereign states to enforce those standards. International and regional cooperative efforts are important and should be promoted, but the global community cannot

afford to wait. Under conventional and customary international law, states not only have the right, they have the obligation to protect the global environment using all the tools available to them.

REFERENCES

Akehurst, M.
1984. A modern introduction to international law. George Allen and Unwin, London, 5th ed., p. 51, 110-11.

American Institute of Taiwan and the Coordination Council for North American Affairs.
1989. Agreement between the American Institute of Taiwan and the Coordination Council for North American Affairs for cooperative programs regarding the monitoring, enforcement and regulation of the North Pacific driftnet fishing operations. Article VII, 13 July 1989. [In force until 31 December 1990.]

American Law Institute.
1987. Restatement of the law, third: the foreign relations law of the United States. American Law Institute Publ., St. Paul, Minn., 2 vols.

Anderson, R.
1989. Foreign "ghost ship" helps prove claims of high-seas salmon thefts. Natl. Fisherm. 70(1):12.

Beasley, H. R.
1984. International organizations and agreements division update. F/M31 NMFS p. 15.

Boyle, A.
1985. Marine pollution under the Law of the Sea Convention. Am. J. Int. Law 79:347-372.

Brussels Liability Convention.
1969. Resolution on international co-operation concerning pollutants other than oil. Attached to the International Convention on Civil Liability for Oil Pollution Damage. United Nations Doc. ST/LEG/SER.B/16 at 447 (1974). [Reprinted in Int. Legal Mat. 9:45.]

Canadian Arctic Waters Pollution Prevention Bill.
1970. An act to prevent pollution of areas of the arctic waters adjacent to the mainland and islands of the Canadian arctic. [Reprinted in Int. Legal Mat. 9:543.]

Canadian Reply to the United States Government.
1970. Reprinted *in* S. Lay, R. Churchill, and M. Nordquist (editors), New directions in the Law of the Sea, Documents, p. 199. Oceana Publ., Dobbs Ferry, N.Y., 1973, 1.

Carr, H. A., and R. A. Cooper.
1987. Manned submersible and ROV assessment of ghost gill nets in the Gulf of Maine. *In* Oceans '87, p. 622-624. Proc. Mar. Tech. Soc.

Cary, F., and R. L. Burgner.
1983. Observations aboard a Japanese squid drift net fishing vessel in September-October 1982. Univ. Wash. Fish. Res. Inst. FRI-UW-8307, Seattle, WA, 23 p. [Final Report to Pacific Seafood Processors Association.]

Cunnard Steamship Co. v. *Mellon.*
1922. 262 U.S. 100, 123; 67 L. Ed. 894, 902.

Defenders of Wildlife v. *Hodel.*
1989. 707 F.Supp. 1082 (D. Minn. 1989).

DeGange, A. R., and T. C. Newby.
1980. Mortality of seabirds and fish in a lost salmon drift net. Mar. Pollut. Bull. 11:322-323.

Eisenbud, R.
1985. Problems and prospects for the pelagic drift net. Environ. Aff. 12:473, 476-478.

Foreign Sovereign Immunities Act.
1976. 28 U.S.C.§1605(a)(2). See also European Convention on state immunity and additional protocol, May 16, 1972, chapter I, article 7; 1982 U.N. draft articles on jurisdictional immunities of states and their property, article 12, report of the International Law Commission on the work of its 34th session, 37 U.N. GAOR Supp. (No. 10), U.N. Doc. A/37/10.

Fur Seal Convention.
1957. Interim Convention on Conservation of North Pacific Fur Seals. U.S. Treaties 8:2284, T.I.A.S. No. 3948.

Gooder, P.
1989. Observations on board the Korean squid driftnet vessel, *Oyang 53*, 9 June-8 August 1988. Northwest Alaska Fish. Cent., Natl. Mar. Mammal Lab., Natl. Mar. Fish. Serv., NOAA, Seattle, WA. Processed Rep. 89-03, 20 p. + tables.

Gordon, W. G.
1985. Pelagic driftnet fisheries: Hearing before the National Ocean Policy Study, Senate Commerce, Science, and Transportation Committee, 9 October 1985, p. 13.

Halibut Convention.
1953. Convention for the Preservation of the Halibut Fishery of the Northern Pacific Ocean and Bering Sea. U.S. Treaties 5:5, T.I.A.S. No. 2900.

Henderson, J. R.
1984. Encounters of Hawaiian monk seals with fishing gear at Lisianski Island, 1982. Mar. Fish. Rev. 46(3):59-61.

Henry, L.
1928. When is a treaty self-executing? Mich. Law Rev. 27:776-785.

Higgins, R.
1984. The legal bases of jurisdiction. *In* C. Olmstead (editor), Extra-territorial application of laws and responses thereto, p. 7 Int. Law Assoc., Oxford.

High Seas Fishing Convention.
1958. Convention on Fishing and Conservation of the Living Resources of the High Seas. U.S. Treaties 17:139, T.I.A.S. No. 5969, U.N. Treaty Series 559:285.

High Seas Protocol.
1973. Protocol relating to Intervention on the High Seas in Cases of Marine Pollution by Substances Other Than Oil. U.N. Doc ST/LEG/SER. B/18 at 457 (1976), T.I.A.S. 10561.

Ignell, S., J. Bailey, and J. Joyce.
1986. Observations on high-seas squid gill-net fisheries, North Pacific Ocean, 1985. U.S. Dep. Commer., NOAA, Tech. Memo. NMFS-F/NWC-105, 52 p.

In the Matter of Kenji Nakata, Ohoura Gyogyo Co. Ltd., 4 O.R.W. 814 (NOAA 1987) (LEXIS Genfed library, Courts file).

International Court of Justice.
1945. Statute of the International Court of Justice. Reprinted in U.N. Yearbook 1970:1013.

1974. Fisheries jurisdiction cases (merits). Reports. *United Kingdom* v. *Iceland*, p. 3; *Fed. Rep. Germany* v. *Iceland*, p. 175.

Intervention.
1969. International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties. U.S. Treaties 26:765, T.I.A.S. No. 8068.

Japan-U.S.S.R.
1956. International Convention for the High Seas Fisheries of the Northwest Pacific, Japan-U.S.S.R. U.N. Treaty Ser. 263:3768.

Japan-United States.
1989. Agreement (2 May 1989) concerning the Japanese monitoring and enforcement programs for 1989.

Japanese Governing International Fishing Agreement.
1982. Agreement between the Government of the United States of America and the Government of Japan concerning fisheries off the coasts of the United States of America, United States-Japan. U.S. Treaties 28:7507, T.I.A.S. No. 10480. [Renewed 29 December 1987.]

[Japan] Fisheries Agency, Canada Department of Fisheries and Oceans, and the U.S. National Marine Fisheries Service and Fish and Wildlife Service.
1990. Final report of squid and bycatch observations in the Japanese driftnet fishery for neon flying squid (*Ommastrephes bartrami*) June-December 1989 observer program. Joint report Fisheries Agency of Japan, Canada Department of Fisheries and Oceans, and the U.S. National Marine Fisheries Service and Fish and Wildlife Service.

Kokechik Fishermen's Association v. *Secretary of Commerce.*
1988. 839 F.2d 795 (D.C. Cir. 1988); *Federation of Japan Salmon Fisheries* v. *Baldridge*, 679 F.Supp. 37 (D.D.C. 1987).

Korean Governing International Fishing Agreement.
1982. Agreement between the Government of the United States of America and the Government of the Republic of Korea concerning Fisheries off the Coasts of the United States, United States-Korea. U.S. Treaties 28:1753, T.I.A.S. No. 8526. [Renewed 10 July 1987.]

Lambertson, R. E.
1985. Pelagic driftnet fisheries. Hearing before the National Ocean Policy Study, Senate Commerce, Science, and Transportation Committee, 9 October 1985, p. 15-17.

Lasok, D., and J. W. Bridge.
1987. Law and institutions of the European communities. Butterworth, London, 428 p.

Law of the Sea Convention.
1958. United Nations Convention on the High Seas. U.S. Treaties 13:2312, T.I.A.S. No. 5200.

1982. United Nations Convention on the Law of the Sea. [Reprinted in Int. Legal Mat. 21:1261.]

Levi, W.
1979. Contemporary international law. Westview Press, Boulder, Colorado, 156 p.

London Dumping Convention.
1972. Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter. U.S. Treaties 26:2403, T.I.A.S. No. 8165.

Magnuson Fishery Conservation and Management Act.
1986. Amendments 1986. Public Law 100-220, Title IV, FF 4001-4009, 29 December 1987, 101 Stat. 1477, §4003(4).

Mannington Mills, Inc. v. *Congoleum Corp.*
1979. 595 F.2d 1287, 1292-93 (3rd Cir. 1979).

Marine Mammal Commission.
1990. Annual report of the Marine Mammal Commission, calendar year 1989: A report to Congress. Wash., D.C.

MARPOL.
1973. International Convention for the Prevention of Pollution from Ships. U.N. Doc. ST/LEG/SER.B/18. [Reprinted in Int. Legal Mat. 12:1319.]

MARPOL Protocol.
1978. Protocol of 1978 relating to the International Convention for the Prevention of Pollution from Ships, 1973. I.M.C.O. Doc. TSPP/CONF/11. [Reprinted in Int. Legal Mat. 17:546.]

Matsen, B.
1989. Brokers arrested in squid-fleet salmon case. Natl. Fisherm. 69:16.

Migratory Bird Convention.
1972. Protection of Migratory Birds and Birds in Danger of Extinction and Their Environment, United States-Japan. U.S. Treaties 25:3329, T.I.A.S. No. 7990.

North Pacific Convention.
1952. International Convention for the High Seas Fisheries of the North Pacific Ocean, United States-Canada-Japan. U.S. Treaties 4:380, T.I.A.S. No. 2786.

North Pacific Convention Protocol.
1978. Protocol amending the International Convention for the High Seas Fisheries of the North Pacific Ocean, United States-Canada-Japan, annex 1. U.S. Treaties 30:1095, T.I.A.S. No. 9242.

OILPOL.
1954. International Convention for the Prevention of Pollution of the Sea by Oil. U.S. Treaties 12:2989, T.I.A.S. No. 4900.

Presidential Proclamation No. 2667.
1945. Fed. Reg. 10:12303.

Presidential Proclamation No. 2668.
1945. Policy of the United States with respect to coastal fisheries in certain areas of the high seas. Fed. Reg. 10:12304. [Reprinted in Statutes at Large 59:885-86.]

Presidential Proclamation No. 5030.
1983. Fed. Reg. 48:10605.

Pruter, A.
1987. Sources, quantities and distribution of persistent plastics in the marine environment. Mar. Pollut. Bull. 18:305-310.

Republic of Korea-United States.
1989. Agreement Annex II, 13 September 1989. Regulatory program and monitoring program on the Korean squid driftnet fishery for the fishing seasons of 1989 and 1990.

Sathre, C.
1986. Salmon interception on the high seas. Environ. Law 16:731-755.

Sohn, L., and K. Gustafson.
1984. The Law of the Sea in a nutshell. West Publ. Co., St. Paul, Minn., 264 p.

Springer, A.
1983. The international law of pollution. Quorum Books, Westport, Conn., 218 p.

Stockholm Declaration on the Human Environment.
1972. Principle 21., U.N. Doc. A/CONF.48/14. [Reprinted in Int. Legal Mat. 11:1416.]

Strassheim v. *Daily*.
1911. 221 U.S. 280, 285, 55 L.Ed. 735, 738.

Taiwanese Governing International Fishing Agreement.
1982. Agreement between the Government of the United States of America and the Government of the Republic of China concerning fisheries off the coasts of the United States, 15 September 1976, United States-Republic of China. U.S. Treaties 28:1904, T.I.A.S. No. 8529; agreement between the American Institute in Taiwan and the Coordination Council for North American Affairs, 15 June 1982. [Not renewed in 1987.]

Timagenis, Gr. J.
1980. International control of marine pollution. Oceana Publ., N.Y., 473 p.

Timberlane Lumber Co. v. *Bank of America*.
1976. N.T. and S.A, 549 F.2d 597, 615 (9th Cir.)

Tsunoda, L. M.
1989. Observations on board a Japanese, high-seas, squid gillnet vessel in the North Pacific Ocean, July 1-August 14, 1989. U.S. Dep. Commer., Northwest Fish. Cent., Natl. Mar. Fish. Serv., NOAA, Seattle, WA. Northwest Fish. Cent. Admin. Rep. NMFS-NOAA-F/NWC-89-02, 23 p. + tables.

U[nited] S[tates] Congress.
1973. Senate Rep. No. 307, p. 1.

1980. House Rep. No. 1224, p. 4.

1987a. Committee Report on H.R. 3674. House Rep. No. 489, p. 23-24.

1987b. Report on the Driftnet Impact Monitoring, Assessment, and Control Act. Senate Rep. No. 261, p. 2-3.

1987c. Report on the Plastic Pollution Control Act. Senate Rep. No. 270, p. 2.

United States v. *Alomia-Riascos.*
1987. 825 F.2d 769 (4th Cir.).

United States v. *Aluminum Co. of America*
1945. 148 F.2d 416 (2d Cir.).

United States v. *Bowman.*
1922. 260 U.S. 94, 98, 67 L. Ed. 149, 151.

United States v. *Conroy*
1979. 589 F.2d 1258 (5th Cir.), cert. denied, 444 U.S. 831.

United States v. *Marunaka Maru No. 88.*
1983. 559 F.Supp. 1365 (D. Alaska 1983).

United States v. *Pizzarusso*
1968. 388 F.2d 8 (2d Cir.)

United States v. *Streifel*
1981. 665 F.2d 414 (2d Cir.).

United States v. *Tsuda Maru.*
1979. 470 F. Supp. 1223 (D. Alaska 1979).

United States v. *Verdugo-Urquidez*
1990. 494 U.S. ___, 108 L. Ed. 2d 222, 230.

Vienna Convention on the Law of Treaties.
1969. United Nations Doc. A/Conf. 39/27.

Von Brandt, A.
1984. Fish catching methods of the world. Fish. News Books, U.K., 418 p.

Way, E. W.
1977. Lost gill net (ghost net) retrieval project 1976. Environ. Canada, Fisheries and Marine Service, Industrial Development Branch, St. John's, New Foundland, 30 p.

Weil, P.
1984. International limitations on state jurisdiction. *In* C. Olmstead (editor), International law limitations on state jurisdiction, in extraterritorial application of laws and responses thereto, p. 33. Int'l. Law Assoc., Oxford.

Wolfe, E. E.
1989. Hearing before the Subcommittee of Fisheries and Wildlife Conservation and the Environment, House Committee on Merchant Marine Fisheries, May 2, 1989.